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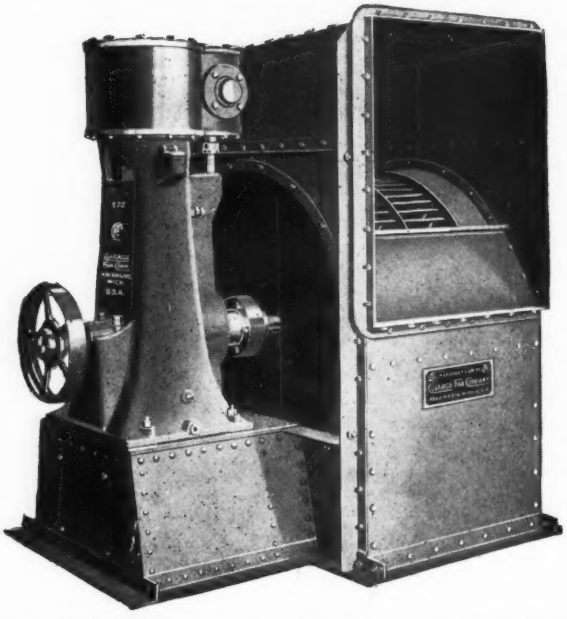

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THE HEATING AND VENTILATING MAGAZINE

JUNE, 1919

THE RISE OF THE UNIT AIR HEATER

A Ductless Method of Fan or Blower Heating Which is Rapidly Coming Into Vogue for Certain Classes of Work.

An evolution in the heating industry that is attracting considerable attention is the growing use of the "unit" heater for factory heating or the warming of large interiors, so called because it is complete in itself and requires only the necessary steam connections to make it ready for operation. It is also portable, making it particularly suitable for the heating of temporary buildings, the heating of large buildings which are otherwise left cold, or for buildings which are put up in sections and to which additions are to be made.

Like other new ideas, those who advocate unit heaters no doubt have gone to extremes in some instances, urging their installation where the conditions did not justfy it. For a permanent building, for instance, the conditions and final dimensions of which are known, unit heaters ordinarily would hardly be suitable. It is necessary to devote a certain amount of floor space to them, very often where it is most valuable, while the extensive steam and return connections and fittings would, of course, go a long way toward offsetting the saving in expense due to the elimination of distributing ducts. It is also necessary to take into consideration the lower efficiency of the small fans used in the unit heaters which may be placed against the horse-power required to move the air through the ducts of an ordinary blast system.

The fact remains, however, that in many cases they have been found to fill a long-felt want and their present popularity is evidence that the unit heater has come to stay. There is something very convenient in being able to warm large rooms with a fan and steam coils, but without making use of distributing pipes for carrying the heated air to different parts of the room. It has been found that even in factories of large dimensions, it has been possible to maintain even temperatures with unit heaters without requiring distributing pipes.

Another reason for the unit heater's popularity is the fact that it does not require the same amount of engineering calculations as the older method. A well-designed duct system means considerable engineering work, both in proportioning the air pipes and in seeing that they are properly placed. The new method needs nothing of this kind, but it does require an understanding of the effect which the laws of Nature have upon the atmosphere of interior spaces and a knowledge of how and where to place the unit heaters so that the natural laws may be best availed of. So that, while in one sense, the unit heater would appear to compete with the knowledge and experience of the expert heating and ventilating engineer, in a larger sense it has become an additional tool for his use and the wise engineer will familiarize himself with its limita-

tions and its possibilities without delay.

While the unit heater is not new, inasmuch as two types have been on the market for some 30 or 40 years, its use on anything like the present scale is a development of the past year or two. This development became the subject of discussion at the summer meeting of the heating engineers held in Buffalo, in 1918, when the Baetz air heater was described at some length. This heater was originated by Henry Baetz, of St. Louis, about sixteen years ago. He also invented the Baetz air heater, which is particularly designed for this method of heating. Until about five years ago Mr. Baetz built his heater and installed his system under the name of the St. Louis Blower and Heater Company. The name was later changed to Skinner Bros. Mfg. Company, with which Mr. Baetz is at present connected and which controls the Baetz patents.

The ensuing discussion at the meeting in question brought out the fact that the American Blower Company, of Detroit, has been manufacturing a unit heater built on separate lines, but involving the same general principles. Further investigation brought out the fact the the B. F. Sturtevant Company, Hyde Park, Mass., put out a unit heater in 1870, known as the "independent unit heater," and first placed in use by B. F. Sturtevant, founder of the company.

One of the latest types of unit heater has been brought out by the Ilg Electric Ventilating Company, Chicago, Ill., under the name of the Ilgair unit heater.

Taking up the various types in the order mentioned, the Baetz heater, shown in Fig. 1, is constructed of steel plates and angles. It will be noticed that the upper part is occupied by steam coils arranged so that they may be removed for repairs. The blower is shown beneath in the same enclosure. Air is drawn in by the fan from two sides and is forced upward against the steam-heated coils, passing out at the top as heated air. A convenient line shaft, a small engine or a motor may be used to propel the fan. The illustration shows where the steam and return connections are made. When a small engine is used for driving the fan the exhaust steam from the engine can be piped direct into the heater coils.

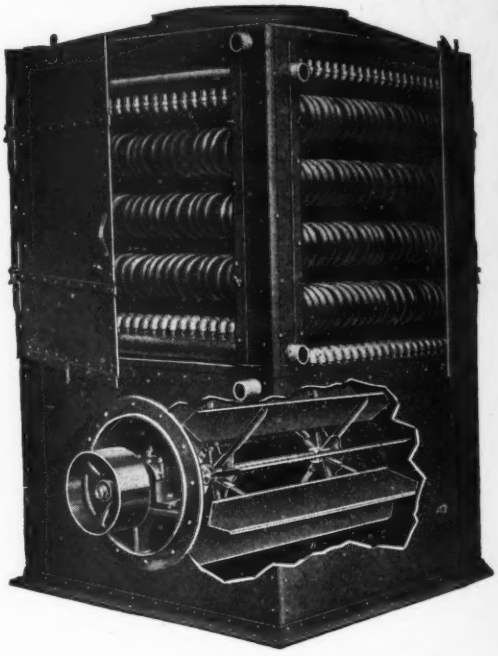


FIG. 1—BAETZ AIR HEATER, SHOWING FAN AND HEATING COILS.

The "A. B. C." unit heater shown in Fig. 2 is so built that air from within the room can be recirculated or a pipe can be attached to extend through the wall or through the roof to heat and circulate fresh air.

The base of the heater is divided by a partition in the center, making two separate chambers, one for the live steam side, the other for the return. There is an internal water-seal at one side of the base to prevent the steam from blowing into the return side before passing through the pipes. Into the top of this base is screwed a nest of steam pipes which are built up in return loops. The disc fan at the top is driven by a small impulse turbine mounted on a bracket outside the jacket. Steam is admitted to the intake of the turbine and passes from the turbine and exhaust pipe into the heater base, thus using the steam for heating.

These heaters, which are made by the American Blower Co., Detroit,

Mich., are furnished in capacities ranging from 1790 to 2070 C. F. M. with corresponding B. T. U. per hour of 180,000 to 236,000, and with steam pressures ranging from 40 to 100 lbs. gauge. When desired the fan may be driven by motor or by belt.

Fig. 3 shows the "independent unit heater," manufactured by the B. F. Sturtevant Co., Hyde Park, Mass.

This unit is equipped with a turbine-driven disc fan and discharges the heated air at the bottom along the floor. It is especially recommended for heating shops, roundhouses, and industrial buildings. The Sturtevant individual heater unit requires but one steam pipe and is arranged so that the exhaust steam from the turbine may be used in the coils.

The heater consists of a disc fan mounted on the top of a sheet-metal casing and arranged to discharge the air down across Vento radiation enclosed in the casing. The outlet discharge is at the bottom and is designed to discharge the air in a horizontal direction along the floor.

The fan is arranged for operation by a direct-connected motor, direct-connected steam turbine, or by pulley for belt drive. The fan wheel is of the multi-blade type, disc fan 26 in. in diameter. The capacity at 2,020 r.p.m. is 6,650 c.f.m.. The heating surface consists of 376¼ sq. ft. of 40 in. American Radiator Vento which will heat the air from an entering temperature of 60° F. to a final temperature of 128° F., causing the condensation of approximately 500 lbs. of steam per hour, steam entering the heater at 5 lbs. pressure.

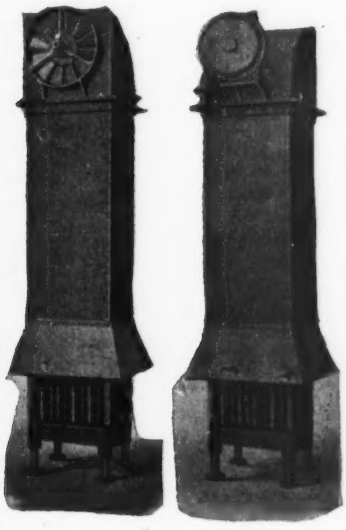


FIG. 2—ABC UNIT HEATER.

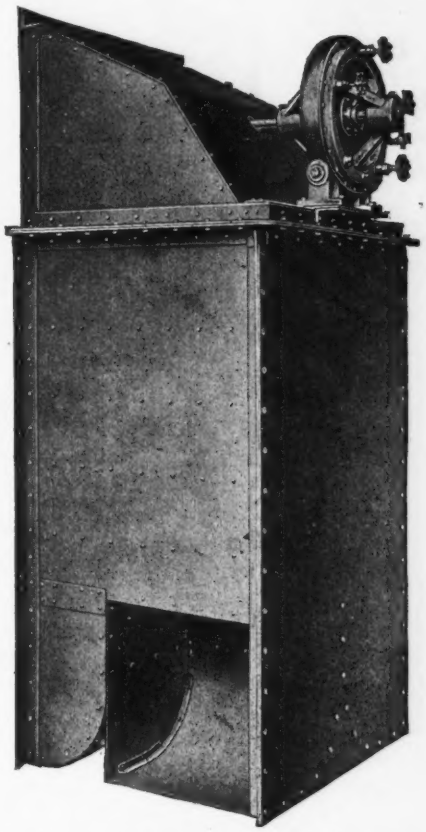


FIG. 3—STURTEVANT UNIT HEATER.

The Ilgair unit heater, shown in Fig. 4, is built on a little different line. It consists of a cabinet, open at both ends, in which is housed an ordinary two-stack radiator and an Ilg self-cooled motor propeller fan. This cabinet acts as a heating chamber for the air which is drawn over the heated coils on the intake side at a low velocity about 1,000 feet per minute and discharged in volume at high velocity, about 2,500 ft. per minute. The heat is controlled at its source, by means of a stationary deflector which serves to spread the air in a horizontal plane, while a movable deflector controls the placement of the air. As the breathing line warms up, the deflector is raised, allowing the current of air to straighten out, easily

reaching, it is stated, a distance of 50 to 60 ft. As the adjustable deflector holds the circulation of air near the floor, the number of heating units required depends entirely on the floor area and not on the height of the ceilings. In practice it has been found that Ilgair unit heaters handling 15,000 C. F. M. with about 650 sq. ft. of radiation will maintain a temperature of 68° F. over 10,000 sq. ft. of floor space, irrespective of ceiling height. In connection with the operation of these heaters an example is given of a building 166 ft. long and 60 ft. wide, covering about 10,000 sq. ft., which can be satisfactorily heated with five No. 20 Ilgair unit heaters handling 15,000 cu. ft. per minute, using but 1½ H. P. It is also pointed out that these units can be used in summer as cooling oufits.

FIG. 4—ILGAIR UNIT HEATER.

PRACTICAL ECONOMIES IN THE USE OF STEAM HEAT

Notes Based on Extended Experience for Getting the Maximum Efficiency from the Heating System.

BY LLOYD HOWELL.

For many years steam has been used to convey heat as well as for power production purposes, and owing to the recent considerable advances in all fuel costs, care and attention to proper utilization of steam in heating systems, correction of defects and elimination of wastage gives results in savings, formerly well worth while, now particularly attractive in monetary amounts.

Considering the average heating season in this country about 5000 hours in length, it is apparent that a loss or waste which may be a slight one for a single hour, if projected over the operation for an entire year, becomes a serious one.

Perhaps the system has been improperly designed, or imperfect material used, or unskilled labor employed, or a combination of all three evils. The result can be surely expected as direct loss to the owner by wasteful steam consumption, or as loss to both company and consumer if steam be purchased, instead of fuel. The general public, too, participates indirectly in these losses, hence the importance of most economical use can hardly be overestimated. The best methods known to modern practice are by far the cheapest to employ and as due appreciation of the weight of this fact as opposed to first or installation cost becomes more manifest, we may look for much future improvement in savings.

Being a gas made from water, steam readily parts with its heat and returns to its former liquid state or condenses. This action must be delayed during travel, from source to destination, otherwise avoidable loss occurs. This will be large if inefficient insulation methods are used. High-grade covering well applied, will keep transmission costs to a minimum.

In a system requiring only low-pressure steam, initial pressure should be low and at a uniform figure. Pressures higher than necessary accelerate wastage, causing greater line condensation, increased liability of leakage and a magnification of any leaks which may be present. A leak from defective connection barely apparent at ½ lb. to 1 lb. pressure will become violent, perhaps destructive at 5 lbs. to 10 lbs. pressure and may cause damage to apparatus or goods stored nearby in addition to loss sustained by escape of steam and water. If exhaust steam be employed the excess appears as back pressure on the engines.

HEATING SYSTEMS SHOULD NOT REQUIRE MORE THAN 1 LB. INITIAL PRESSURE.

As a general rule, any heating system which cannot give satisfactory service with 1 lb. initial pressure is defective, so there need be no occasion for back-pressure greater than 1 lb. plus the pressure drop between engine exhaust and the service connection to the building. It is absolutely essential that the system be first-class for like service to be given.

DISTINCTION NECESSARY BETWEEN HEATING AND VENTILATING REQUIREMENTS.

In designing, a clear distinction should be made between requirements for heating the building and those for warming the amount of air deemed necessary for good ventilation, for, if it be obligatory to operate a ventilating system to secure enough heat there certainly will occur periods during operation where full temperatures are obtained only by excessive steam consumption, as the heat requirements are dependent on the out-door weather, while the ventilation need be provided only for the number of people to be served. Design for the ventilation system ought, therefore, be divorced from the heating system, with adequate control methods applied to each.

Control of temperatures by opening windows and doors is expensive. Likewise, if high room temperatures are maintained corresponding bills must be expected.

Frequently air heated by the system is too dry and rooms are overheated without the fact becoming apparent to the occupants. The benefits to health derived from judicious use of humidifying devices are also becoming apparent, and it is quite regularly discovered that room temperatures can be materially reduced if proper degree of humidity be maintained, thereby considerably lessening operating expense while improving living conditions.

INSUFFICIENT CAPACITY OF HEATING SYSTEM A SOURCE OF EXPENSE.

It is important that the capacity of the system be sufficient for weather extremes. If scant heating surfaces are used, livable temperatures cannot be had at certain times and an abnormal amount of steam is used giving both expensive operation and unsatisfactory service. Frequently, poor piping installation accompanies insufficient heating surfaces. It may be found so arranged that by reason of short circuits of improper grades of obstruction to air escape, it does not provide a channel for quick and uniform steam distribution, noiseless and rapid flow of condensate, and free delivery of all entrained air.

DAMAGES CAUSED BY INCORRECT INSTALLATION.

Damages caused by incorrect installation are often serious. A sagging or pocketed pipe or radiator presents a favorable condition to the development of a "water hammer" which, if severe enough, will result in breakage of some part and always is very troublesome and annoying.

Frequently, uncovered piping used for steam distribution is also employed as part of the heating system. This practice cannot be recommended as no control of heat delivery is possible without entirely shutting off the line. The proper method is to thoroughly insulate all steam lines, preferably with standard thickness 85% magnesia covering and to then place correct amounts of heating surfaces with controlling valves where required.

PROTECTION OF STEAM PIPING IN ATTIC SPACES, WALL CHASES AND BASEMENTS.

In placing piping in attic spaces, in

wall chases and in unoccupied basements, the building structure should be such that no undue exposure condition be presented. Spaces should be tight enough to prevent air currents or leakages. Chases should be lined and fitted with covers to facilitate inspection and repair and the pipes should be well insulated.

Where necessary to place steam piping under basement floors, well drained concrete trenches should be provided and the piping therein supported and covered as carefully as though suspended from the basement ceiling.

Unless all concealed piping is most carefully installed and protected the heat loss from that portion of the system is certain to be excessive. A considerable percentage of the total amount of heat is found in the condensate, yet many heating installations have been made without any provision for usefully abstracting this heat. Frequently, it is argued that with a direct return of the water to boiler for re-evaporation the feature of placing economizing surfaces, either in each unit or by additional units, may be omitted.

This argument is apt to be misleading. We are considering a vehicle for delivering heat and the carrier should be tight enough not to spill or leak unduly and should be fully unloaded and returned empty, otherwise we must expect extra losses on the complete journey.

VALUE OF ECONOMIZER SURFACES.

Where steam is not generated in the building, but is purchased from an outside source the advantage of obtaining heat from the condensate is unquestioned, as the modern practice entirely favors a charge for the weight of steam used and nearly all rates for steam service are based upon an amount per 1000 lbs. delivered and registered.

Preference is given for the method of enlarging the heating surfaces in which the steam is condensed rather than placing extra units, because greater efficiency can be realized by at once delivering the heat to the room through the surface therein located instead of delivering the hot condensate to remote units from which the heat must be transferred.

FEATURES THAT SHOULD BE EMBODIED IN HEATING SYSTEM.

A design embodying the features of uniform flow of steam, simple in character, with as few special devices as possible and permitting gravity return is best both from the standpoint of first cost and of operating expense.

Often pumps of vacuum type or for other duty are employed, where by a careful study of conditions their use might be abandoned. The features of cost, interest, depreciation, repairs, attention and operation inseparable in connection with handling any piece of machinery are quite enough to warrant serious consideration before adoption. Furthermore, it is highly important that the correct operation of a heating system be not dependent upon pumping operation, if avoidable. Installations where pumps have been operated for years in order to secure steam circulation are frequently observed and, with slight changes, such systems are found to give satisfactory service after shutting down the pump operation.

An additional advantage in having special devices, few in number and simple in character lies in the fact that any appliance must be given reasonable attention to keep it in first-class working order. Radiator valves of certain types, and particularly air valves, permit the escape of considerable amounts of steam if out of adjustment or repair. Periodic inspection and immediate correction of defects will prevent much wastage.

Presuming the system is modern and first-class, with an individual boiler service the operator can be assured of maintaining a low level in costs, by watchful care in the use of steam after leaving the boiler room, provided intelligent boiler manipulation and skilled firing is employed. A poor fireman can defeat the best efforts of skilled superintendence elsewhere, and on the contrary correct firing is essential to economical use of fuel and consequent reduction of heating costs.

The firing problem need not be considered by the building owner where steam is purchased, which is one reason for the popularity of central station service.

CHICAGO COMMISSION ON VENTILATION

AIR WASHER EXPERIENCES

Defects Found in Present Construction and Operation, With Suggestions for Improved Design.

BY SAMUEL R. LEWIS AND DR. E. V. HILL.

The modern commercial air washer is still in process of evolution, and the scope of its field is limitless. Daily, new uses are being found for its application in manufacturing processes, and its influence on the munitions production of the country during the war was profound. As a humidity-controlling device the air washer is indispensable.

As with most comparatively new devices it must of necessity develop slowly from a crude beginning, by the cut and try method. The phases of its activity having the most spectacular evidences manifest themselves when we consider the air washer as an air cleaner. This sentence illustrates aptly the crudity of the present state of development, for even the name is a poor fit, since in many cases, the removal of dirt is a secondary consideration, and "to wash" a gas is not exactly a happy expression for the process of moistening, or drying, or removing odors, or taking out dust.

There are a large number of air-conditioning machines in the congested districts of cities used for cleaning the soot and dust from the air required for ventilation. We believe that it is safe to say that most of these machines are so installed and cared for as to deliver not over 50% of the efficiency of which they are capable. We believe, also, that on account of unfortunate construction and installation a very large percentage of the machines are incapable, even with good operation, of giving satisfactory results.

We feel, therefore, that some description of these faults in operation and construction are pertinent at this time, with some general suggestions for their avoidance or amelioration.

EARLY ATTEMPTS IN AIR CLEANING

Ever since air has been handled, various forms of dry filtering or screening devices have been used, as of cotton, felt or cheesecloth, or fine mesh screens. All of these were found very rapidly to clog with dirt, stopping the air passages, and, when subjected to the least jar, to pollute the passing air with a cloud of the accumulated foreign matter. With any filtering device having small interstices, where there is any great amount of moisture present, the filter will become very quickly obstructed. For this reason, in any continuous process, we believe that dry cleaning gives results little better than no cleaning at all.

The original air washer was simply a rainlike stream of cold water falling through the air-way of a ventilating system. Some of the particles of dust (by dust we mean soot and all other foreign matter) were knocked down to the wet floor by the falling water, and were washed away. Some of the dust stuck to the wet side walls, but most of it passed on.

Wire baskets or screens filled with coke and subjected to a spray of water were tried, and while they arrested much of the dirt, the dirt stayed in the coke, and wonderful crops of bacteria would grow in the favorable conditions created and appalling odors would emanate from the foul coke beds.

DEVELOPMENT OF PRESENT TYPES.

Gradually a process and devices were developed until the present type was evolved, consisting of a water spray followed by metal eliminators intended, by sudden changes in direction of the air current, to catch the drops of water carried away from the spray chamber by the air current. The water is circulated by a pump, through the sprays, falling into a tank below them, from the tank through screens intended to keep dirt from clogging the spray heads, to the pump, and back to the sprays.

There are various proprietary accessories to this type of air washer, some covered by more or less effective patents, such as distributers to insure uniform velocity over the entire cross section, various shapes and methods of supporting eliminators, devices for flushing out clogged spray-heads automatically or manually, none of which apparently prevents any person from building some sort of a so-called air washer.

REQUIREMENTS OF HUMIDITY-CONTROL APPARATUS.

In the field of humidity control there are many devices of value, and there seems to be much less irresponsible exploitation. The control of the temperature of the air and of the water by automatic devices at the time they touch each other gives a possibility of humidity control for the conditioned air. If these matters are not controlled the water may get too cold, chilling the air, or the air may warm the water so much as to give a resultant air unduly moist, or the whole thing may freeze.

The usual air-cleaning and humidity-controlling installation of modern type, and the only one holding any chance of giving satisfaction consists of:

1. A heater to warm the air above the freezing point before it touches the water. This is usually a steam radiator and should be controlled by a thermostat placed *out of doors,* turning off the steam entirely except when the temperature is below freezing, and never warming the air much above the freezing point. It is possible but not particularly desirable or safe to dispense with a tempering heater by heating the water of the washer to such an extent that even though encountering moving air at a temperature below zero this water will not freeze, but will warm the air above the freezing point.
2. A spray chamber, in a water-tight encasement above a tank, having a number of heads, spaced so as to induce as nearly as possible a uniform contact between air and water. Since the water all falls to the bottom of the chamber, the air passing near the bottom must pass by more water than that passing the topmost spray, and the higher the machine the more apparent this phenomenon becomes.
3. Eliminators arranged so that the streaming water shall wash off the particles of dust or mud which constantly impinge on the surfaces. The first row of eliminators will be wet with streaming water; the next row will be wet but not with such enthusiasm as the first row. The next row will be moist, while the next row may be quite dry to the touch, intercepting only an occasional drop of water or particle of dust.
4. A heater, to warm the supposedly cleaned air to the temperature required for its introduction into the building. Usually this heater is expected to warm the air from, say 35° to 68° F., and this heater must be controlled by a thermostat, preferably in the discharge duct from the fan.

SERVICE REQUIRED OF ELIMINATOR PLATES.

When your hands are dirty, particularly with the grime of a day's work, try to get them clean merely by holding them under the faucet. Your effort will be wasted unless you use soap, and scrub. The above-described eliminator plates are subjected to a service infinitely more contaminating than that which affects your hands. As ordinarily built, the front layer of these plates, however, cannot be reached by a spray even as strong as that from your faucet, while all succeeding layers are never washed at all. Yet the air

for ventilating beautiful and elaborate buildings, or for insuring cleanliness in delicate manufacturing processes may be drawn at high speed in most intimate contact with such surfaces.

Actual tests by members of the Chicago Commission on Ventilation have proven that, in some cases, more dust and bacteria colonies were observed in samples taken after the air had passed air washers of ordinary type in ordinary operation with ordinary care than could be detected in samples taken at the inlet from outside. "Ordinary operation and care" means that the air washer shall be considered much the same as a fan—as long as it can be made to turn over it is all right. The pump and motor usually are kept oiled, the spray heads are kept open if not too hard to reach, and the water usually is changed once in two weeks or so. The eliminators are never removed until they fall to pieces, and the dust and debris in the air-ways are never touched. In fact, in most cases the air-ways are entirely inaccessible and could not be cleaned even with the best of intentions.

CONDITIONS FOUND IN A CHICAGO OFFICE BUILDING VENTILATING PLANT.

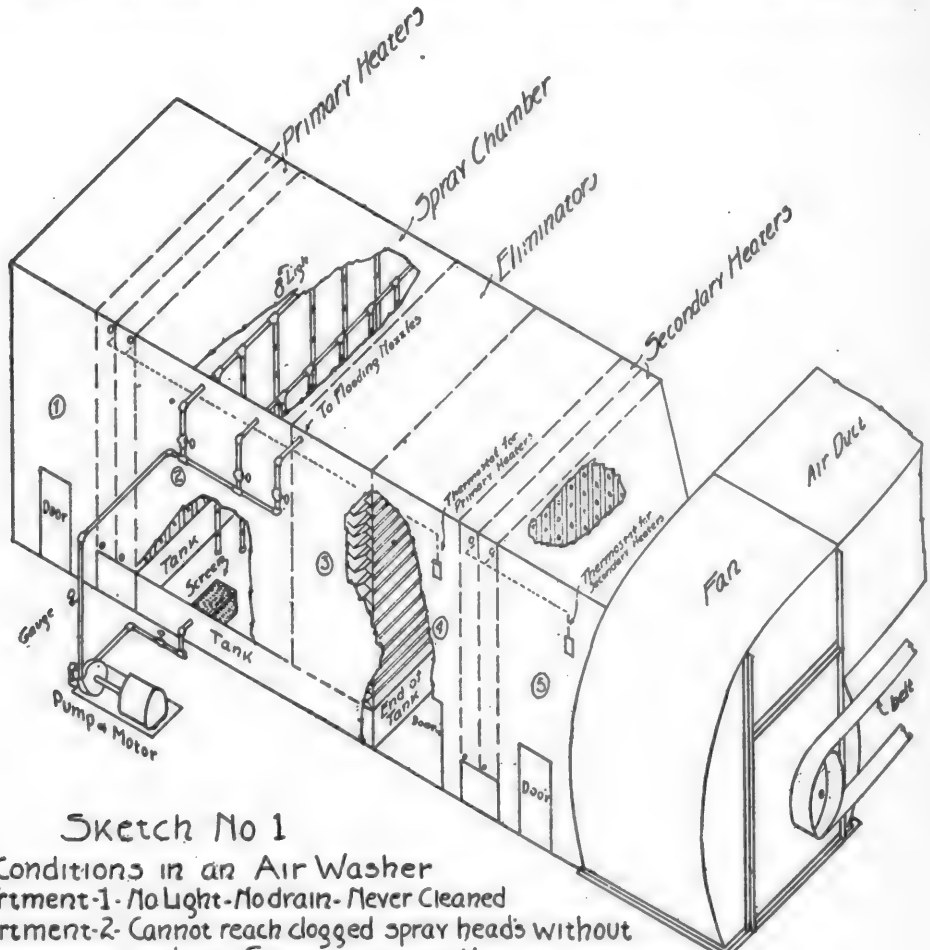
We had occasion recently to observe a ventilating plant in a Chicago office building. It was two years old, in the heart of the "loop." The air supply was drawn from the bottom of a court at the fourth floor level, probably a point as clean as could be found anywhere in the congested districts. There was of course contamination by smoke, city dust, and possibly some influence from a boiler-room discharge vent, four stories down and some fifty feet away horizontally. The attendance was of the most mediocre kind, to such an extent that the ½-in. mesh intake screen was 50% clogged with mud formed by dust and rain, while the spray heads were being operated with 25% of the number not running. The plan is shown in Fig. 1. Some of the structural and operating deficiencies which we found at this plant and which are commonly found in many ventilating plants of similar characteristics were as follows:

1. Heaters intended merely to prevent freezing were controlled by an inside thermostat set at 60° F., resulting in an unduly high humidity and a constant musty odor throughout the building.
2. The heaters between the washer and the fan were controlled by an additional inside thermostat which usually kept them shut off.
3. There was no means of flushing the spray-heads or cleaning them, except by shutting down the pump and wading through the 18-in. deep pan of water to reach them.
4. The eliminators were wet only by the surplus water dripping over them from flooding nozzles above the top layer (baffles were horizontal). The fan had been operated at times without running the washer, and such dust as accumulated on the baffles at that time would stick there, being puddled by the water, and never running off in the gentle current of the same, until by having grown accretions such as form icicles, it would fall off of its own weight. The rear baffles, which were never wet in any event, were covered by soot and dust at least one-half inch deep. Every time the fan was started or a sudden puff of wind caused an unusual commotion, this dust would be raised and would be disseminated throughout the building. While the baffles at considerable labor could be removed and cleaned it is an arduous task, and in this case, where no instructions covering such cleaning were provided, and no lights were furnished to facilitate it, the cleaning was never done.
5. The fan was provided with a speed-controller and the tendency on the part of the operator was to run it at about 40% capacity, though at full speed it would not furnish more air than the needs of the building justified. Running so much less air through the washer than its calculated capacity would tend to some extent, at least, to cause a high resultant humidity.

6. The direct radiation used for heating the building was not provided with automatic temperature regulation, and in mild weather would when assisted by the considerable heat from light and occupants, cause a high temperature in the rooms. The operator, instead of shutting off the direct radiation in advance of such a situation, would reduce the temperature of the air handled by the fan, causing serious complaint of drafts. Experience shows that such complaint will nearly always come when the air for ventilation is admitted more than about ten degrees cooler than the air in the room.

7. This complaint had caused the installation of large metal curves in front of all supply registers, in the hope that blowing the cool air against the ceiling would so spread and deflect it as to still the complaints. These curves, however, prevented good air distribution under normal temperature conditions, served as dirt reservoirs, were seldom cleaned and were always ready at every jar or draft to spread their burden on the air.

It is small wonder, with such an equipment so poorly operated and cared for, that the name of ventilation and air conditioning became a byword



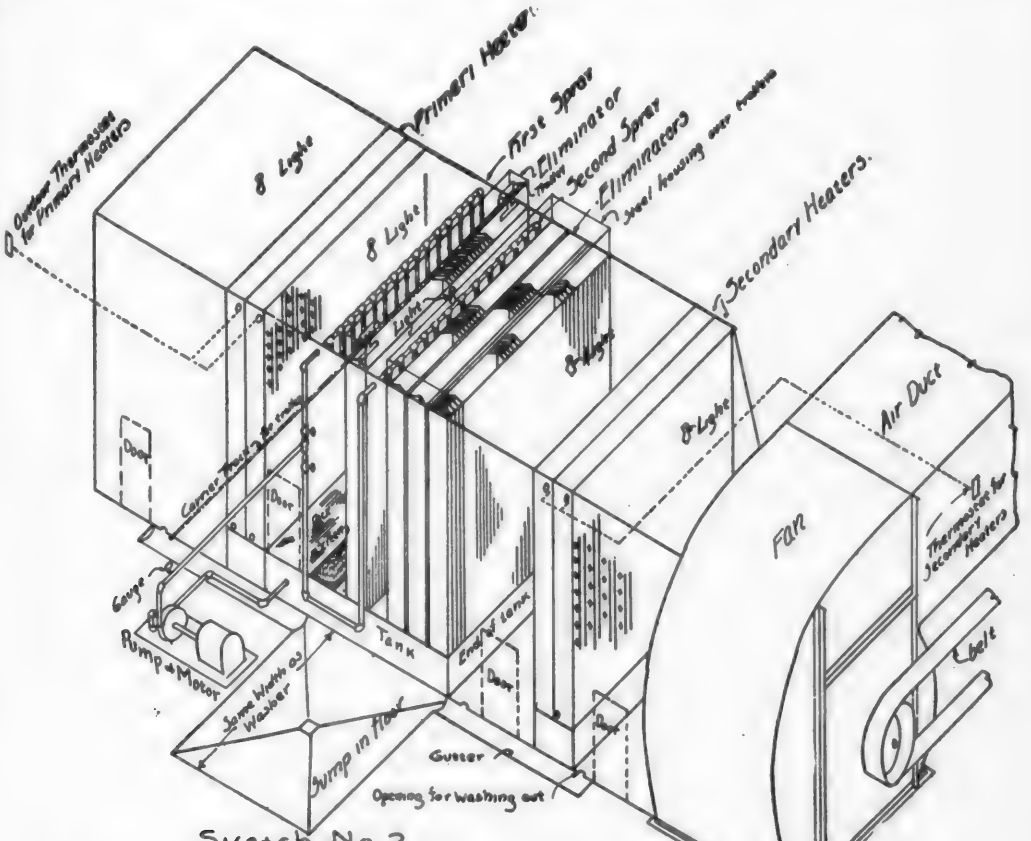
Sketch No 1

Poor Conditions in an Air Washer
Compartment-1- No Light-No drain- Never Cleaned
Compartment-2- Cannot reach clogged spray heads without wading- Screen too small.
Eliminators-3- Never Cleaned - Mostly dry and holding dust. Cannot be cleaned without tearing down.
Compartments-4 & 5- No lights- No floor drains- Never cleaned.
Pump - Insufficient Pressure - Fan - often operated without washer.

in that institution. We cannot claim to have infinite prevision or that sublime experience which would allow us to proclaim our ability to set forth conditions which would prevent such an affair as we have described. We know the well-proven and sure preventative of many of the faults, however, and believe our suggestions as to avoidance of the others, at least have merit.

CONDITIONS THAT SHOULD BE MET IN SALE, INSTALLATION AND OPERATION OF AIR WASHERS.

An air washer as now devised is far from being an automatic and fool-proof device. Its functions are of so great importance that it should never be installed in any plant except under conditions which will insure its proper upkeep. It should be interlocked, in such instances, with the fan to the extent that one could not be operated without the other, and, in our judgment, an air washer should never be sold without service such as accompanies a high-grade automobile. The manufacturer should secure a price for the installation which will enable him to inspect the plant regularly, and both manufacturer and owner should be bound by a contract which requires such service by one, and proper maintenance and operation by the other. Unless these conditions shall have been fulfilled, no air washer should be installed, for without them the manufacturer incurs a liability and the owner throws away his investment. In the specific case described, which exists in Chicago today, there is no recourse for either manufacturer or owner, as



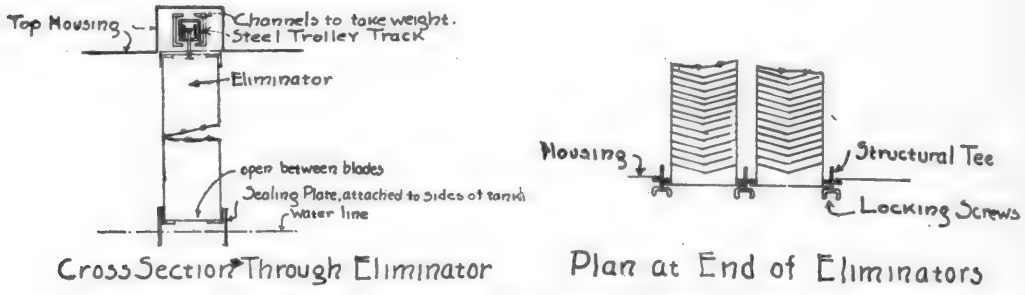
Sketch No 2
Suggested Improvements for Air Washer
Eliminators May be Pulled out and Scrubbed.
All Compartments May be Scrubbed and Flushed out.
All Sprays are accessible.
Fan Can not be operated without Washer.

neither will cheerfully bear the cost of rebuilding the machine and neither can fairly take all the blame.

The washer described should have a thorough cleaning and permanent lights to insure complete inspection. It will have to have a new pump and motor, which will handle adequate water at a pressure which will dislodge the mud. It will have to have an adequate screening surface to keep out debris which stops the sprays, and with the eliminators as installed, to prevent this fouling, there will have to be a complete line of nozzles across every baffle. This is impracticable in the present construction and it would in all probability be easier to replace the horizontal baffles with vertical baffles, as dirt may be more easily removed from such surfaces.

of the front baffles, and two sets are called for so as to gain a thorough cleaning effect. It has not been demonstrated conclusively that a deep spray chamber, irrespective of wet baffling surfaces, is of sufficient importance to pay, while it has been demonstrated quite conclusively that without wet baffling surfaces cleaning cannot be accomplished.

As shown in the drawing, the eliminator plates are built in layers and are carried on a trolley, so that in a manner not unlike laundry dryer trays any layer may be drawn out and cleaned from both sides. Each compartment has a drain connection so that the entire interior can be washed out frequently, but arranged to prevent sewer gas contamination which as is likely to occur when trap seals evaporate.



DETAILS OF ELIMINATOR IN SUGGESTED IMPROVEMENTS FOR AIR WASHER.

As far as removing dirt alone goes, it is probable that close-set vertical baffles, impinged upon over their entire length by strong jets of water, will be most effective, and while there must be some dry or semi-dry baffles behind these wet ones, they should be in removable layers or otherwise arranged so that they can be scrubbed down periodically.

SUGGESTIONS FOR IMPROVED AIR WASHER DESIGN.

It is suggested that if such accessibility is arranged for, a vacuum cleaner tool can be devised which will catch all clinging contamination. One way of carrying out an improved scheme is illustrated in Fig. 2. Here there are two sets of sprays arranged so that they must wet thoroughly the entire surface

We are prepared to say that any installation which will not permit of enough room for a washer having such an arrangement as this or an equally simple and effective one or a better one, should not be made. If such an improper installation were made, it would eventually be condemned, in any event.

It is possible, by simple commercial devices, to arrange so that the fan cannot be started unless the main electric switch is closed by a float in the washer tank, and unless a similar parallel switch on the washer circulating pump is also closed. Thus the fan cannot be operated unless the washer is operated, and, in ordinary ventilating installations and most installations where manufacturing processes are involved, such a provision is of importance.

DIRECTIONS THAT SHOULD BE PROVIDED FOR OPERATING AIR WASHERS.

We suggest further that a metal plate should be permanently attached to the washer, bearing a legend something like the following:

The fan should never be operated unless the washer is in operation. To start the apparatus the city water must

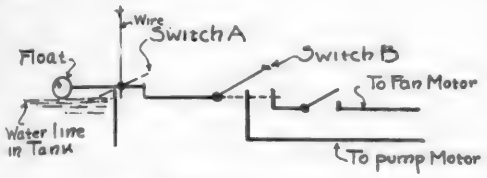


Diagram of Electric Wiring
1 No Motors can run unless Switch A is closed by tank float.
2 Switch B starts pump and permits Fan to be operated
3 Stopping pump stops Fan
4 Fan can be stopped without stopping Pump.

DIAGRAM OF ELECTRIC WIRING IN SUGGESTED IMPROVEMENTS FOR AIR WASHER.

be turned on, filling the washer tank. Be sure that the valve which drains the tank is closed, and that the valves between the tank and the circulating pump are open. When the washer tank is full, the main switch will be closed, and the circulating pump switch may be closed. Closing this switch closes the switch to the fan motor, so that the fan may be started. To stop the fan, open the pump switch which will stop both fan and pump. As often as the water becomes turbid waste it to the sewer and flush out the tank clean with the hose provided, filling the tank with fresh water. This may be as often as every two days, but usually every week will be often enough. At least every two weeks pull out the eliminator baffles and wash them clean with hose and brush; at the same time wash out all air chambers and scrub the heaters.

Keep all of the spray-heads open, inspecting them frequently through the windows provided. The inner sprays may be reached by pulling out No. 1 baffle. A pressure of at least * blank pounds, shown on the gauge, should be maintained by the circulation pump.

(Specific instructions concerning water temperature should follow where humidity control is provided, or where artificial cooling is a function.)

* This pressure should be such as to give the best efficiency with the type of spray head used.

HEATING AND VENTILATING PLANTS AND MECHANICS' LIENS

A Review of Pertinent Appellate Court Decisions Defining the Circumstances Under Which the Security is Available.

By ARTHUR L. H. STREET.

(Concluded from May Issue.)

A CASE WHERE A LIEN CLAIMANT WAS NON-SUITED.

An air furnace not fastened down, and installed in an old house to replace another furnace was held by the St. Louis Court of Appeals not to sustain a mechanic's lien under a statute giving liens for installing "fixtures," etc., in buildings. (Baldwin vs. Merrick, 1 Missouri Appeal Reports, 281). The reasoning of the court was as follows:

"In Main v. Schwardzwaelder, 4 E. D. Smith (N. Y.), 273, a furnace was held to be a fixture; but this was a case of vendor and vendee, and the furnace was so placed that it could not be displaced without disturbing the brickwork of the adjoining wall, and endangering the ceiling.

"The furnace in the case before us was not attached to the floor. It weighed 1,500 lbs., but was not fastened down, but merely incased with brick and mortar upon a platform of brickwork which was there before the furnace was put into the house, and had been used formerly as a stand for a similar heater. The pipes running through the house were no part of this furnace, and were in place before it came, and used for the old heater. Any power of sufficient strength could have lifted the furnace from the brick flooring on which it was placed, and carried it bodily out of the house without disturbing the walls, the ceiling, or the floor of the house itself. As between vendor and vendee, it would, perhaps, have been a fixture; as between lessor and lessee, it would not. We do not think it was a fixture within the meaning of the law giving a lien to mechanics; and we hardly think that any straightforward, intelligent mechanic would have imagined, in placing it there, that he had a lien upon the building in which it was placed, and the lot on which that house was erected, for its payment.

"The policy of the law is to secure the classes of persons named in the act, upon a substantial compliance with its provisions on their part, without unfriendly strictness in scrutinizing the enforcement of the remedy where it is clearly given. But it is not the policy of the law to extend the scope of the act so as to include classes of manufacturers and traders not entitled to its benefits, to give a lien to a stove dealer because a stove has been called a fixture for some purposes of the law."

SAME COURT ADHERES TO THE GENERAL JUDICIAL TREND.

But in the later case of Goodin vs. Elleardsville Hall. Assn., 5 Missouri Appeal Reports, 289, the same court decided that heating apparatus had been sufficiently attached to real estate to support a lien. The St. Louis Court of Appeals said:

"There was evidence tending to show that the furnaces were put in when the building was approaching completion, the work occupying about three weeks. No other provision existed for heating the building, which was used as a livery-stable on the first floor, and as a hall on the second floor, and as a lodge-room for society meetings on the third floor. The furnaces weighed over 2500 lbs. were put up in sections, and were cemented to their place, and set on and cemented to brick foundations laid by plaintiff in cement on the ground floor, and could be removed only by taking them apart in sections. The hot-air flues were carried to the top story, passing into the register-boxes cut into and nailed to the floor. Holes were cut for them in each floor, and one joint in each floor cut to admit them; they were sheathed in the floors with tin, and

firmly attached to the woodwork. Air-ducts in the first story furnished fresh air for the furnaces. The smoke-flues were connected with the brick walls, and entered flues therein. The holes in the floors were cut by the carpenters, when the building was put up, for the purpose of receiving the flues.

"The trial court declared the law as follows: 'If the court, sitting as a jury, finds that the two furnaces mentioned in the petition were placed in the building for permanent use; were placed on a bed of bricks and mortar in the first story; that there was no cellar or basement; that these furnaces were so large and heavy as to be put in place in sections, and the joints cemented; that the furnaces were connected with the brick walls of the building, and with flues therein constructed for them, by smoke-pipes; and that the hot-air flues from said furnaces were carried therefrom through the floors and plastering of the second and third stories of said building, and so connected thereto that their removal would cause injury to said floors and plastering, such as to entail more or less repairs therefor;—if these facts are found to be true, then the law is that such furnaces are fixtures under the mechanics' lien law of this State.'"

Under appellate court decisions in Indiana and Pennsylvania heating plants installed in hotel buildings have been determined to be so far permanent features of the realty as to support mechanics' liens securing claims of the contractors who installed them. (Siegmund vs. Kellogg-Mackay-Cameron Co., 38 Indiana Appellate Court Reports, 95, and Dimmick vs. Cook Co., 115 Pennsylvania State Reports, 573.)

CASES WHERE LIEN CLAIMANTS FAILED FOR WANT OF PROOF.

In the case of Michael vs. Reeves, 60 Pacific Reporter, 577, the Colorado Court of Appeals ruled against plaintiff's right to enforce a mechanic's lien against defendant's dwelling house property for installing a furnace. Plaintiff was nonsuited because he failed to prove the allegations of his complaint that the furnace was installed in the construction of the house.

"There was no proof," said the court, "that Taylor [the owner of the house when the furnace was installed, defendant having subsequently become the owner under mortgage foreclosure proceedings] ever constructed any dwelling house or any building of any kind on any land. The proof was that he owned a house when the contract [for the installation of the furnace] was made, and that the furnace was placed in that house. * * * There was therefore a failure to prove that the furnace was furnished for the construction of the house. Where the work which the plaintiff included in his claim was done, or what connection, if any, it had with the house in question, he did not attempt to show. * * *

"But it does not appear that this furnace was so placed that, in any event, it could be the basis of a lien upon the building. Placing stoves or chairs, or other portable articles, in a house, would give no right to a mechanic's lien, and, for aught that was shown, the furnace never lost its character of movable personal property."

Another decision in which a court adhered to the principle that heating equipment must be constituted a permanent part of the realty before a mechanics' lien can attach to the land was handed down by the Maine Supreme Judicial Court in the case of Lambard vs. Pike, 33 Maine Reports, 141. Disallowing a lien claimed on account of portable heating equipment, the court declared that, "to create a lien, the materials must be used for erecting, altering or repairing the building; must be so applied as to constitute a part of the building. It will not be sufficient that they be placed in it for its more convenient use."

DEALINGS WITH TENANTS AS BASIS OF LIEN.

Ordinarily, the owner of premises is not to be charged with a mechanic's lien on account of heating equipment or other apparatus installed upon the premises by a tenant. But the decision of the Appellate Division of the New York Supreme Court in the case of Meistrell vs. Baldwin, 144 Appellate Division Reports, 660, shows that special circum-

tances may vary this general rule. In the cited case it was decided that where a lease provided that the tenant should have a steam heating plant installed for which he was to be allowed $200 a month by way of deduction from the rent, and the landlord subsequently sent a contractor who had done such work for her on other premises to the tenant to make the agreement for the work, the contractor, who thereupon secured a contract from the tenant and performed the work for which the tenant afterwards refused to pay, was entitled to foreclose a lien against the premises for the value of his services.

A somewhat similar case was decided by the Minnesota Supreme Court along the same lines. (Northwestern Lumber & Wrecking Co., 125 Minnesota Reports, 107.) In the Minnesota case, the owner of a building leased it for several years with an option in the tenant to purchase the property. With authority from the landlord the tenant caused certain permanent improvements to be made on the property, including the installation of a combination steam and power heating plant. The equipment was purchased by the tenant from the manufacturer, but was installed by one Roberts, a contractor. A chattel mortgage was given to the manufacturer to secure payment of the price. This was held to waive any right in the manufacturer to treat the plant as having become part of the realty and hence a basis of a mechanic's lien against the real estate, for the taking of the mortgage implied continuance of the plant as personalty. But the contractor was not so bound and was held to be entitled to enforce a lien for his services and materials furnished in the installation.

VENTILATING APPARATUS AS TRADE FIXTURES.

But where it appeared that ventilating apparatus was installed by a tenant who used part of a building as a restaurant, and that this apparatus was fairly regardable as a resonable trade fixture, the Illinois Appellate Court decided that no lien could be asserted against the premises (McAlear vs. New York Life Insurance & Trust Co., 177 Illinois Appellate Court Reports, 339). The court said in that case:

"The apparatus consisted of a metallic exhaust fan and connected metal canopy over the kitchen range, located under the street sidewalk, with a motor to drive the fan, and a metallic pipe connection from the fan to a tile flue. This tile flue was not a part of the work. It extended north to an air shaft in the middle of the building, and at the north end of the flue a new metal duct was put in it as it was thought that the old duct was not large enough. The motor and fan were placed on a pier, or rather a recess in the street side of the foundation and fastened by lag screws or bolts in wooden plugs sunk in holes drilled in the masonry. The canopy and connecting pipe were suspended by hangers fastened from wooden sidewalk overhead.

"The items for which a lien is claimed are:

"1—13 'Type L' Blower,

"1—13 H. P. Motor,

"656 lbs. Galvanized iron, bolts, rivets, nails, etc.

"Labor, Cartage and Carfare.

"That the apparatus, or part of it, was in some way attached to the building and the sidewalk under the street, cannot be questioned under the evidence, but as between the landlord and the tenant we are of the opinion that the material and work constituted a mere trade fixture and was not the proper subject of a lien as against the building. The distinction between ordinary materials and trade fixtures with respect to being proper subject of lien under our statute is stated in Haas Elec. Co. v. Amusement Co., 236 Ill., 452. In that case it is substantially held that our statute has modified the law with reference to ordinary material furnished, but in the case of fixtures, apparatus or machinery it must appear that they are so installed as to become a part of the real estate.

"In Baker v. McClurg, 198 Ill. 28, it was held that in a building erected and used for a bakery, the brick ovens and the boiler enclosed in brick masonry, and the engines, etc., were removable by the tenant.

"On the above authorities we are of the opinion that the articles furnished in this case were removable trade fixtures and were not permanent fixtures or im-

provements to the building. In our opinion the intention with which they were installed is important in determining whether they become part of the realty. The canopy, fan and motor were installed by the tenant for the purpose of carrying off cooking odors from a small part of this building. They were installed under the sidewalk in a space used for a kitchen by the tenant. They formed no part of the ventilating system of the building. They were installed for the particular business then conducted by Tom Jones in a space rented by him and were not intended as a permanent part of the real estate, if it be assumed that the space under the sidewalk was a part of the premises leased. Their removal from the premises could be made without any damage to the realty. In our opinion the landlord was powerless to prevent their removal by the tenant or his receiver in bankruptcy."

Since the foregoing article was prepared the Appellate Division of the New York Supreme Court has handed down a decision (Dec. 13, 1918) reaffirming in express terms the point that a steam heating plant and all its appurtenances are to be regarded as parts of the real estate to which affixed. The court said in this case (Realty Associates vs. Conrad Construction Co.):

"The appellants contend that the boilers and steam radiators remain personalty, notwithstanding their affixion to the realty, under the doctrine of Central Union Gas Co. v. Browning, 210 N. Y. 10, 103 N. E. 822. That case concerned gas ranges annexed to the realty in a manner very similar to that of the annexation of the radiators and boilers in the present case. If the chattels in question were not part of a steam-heating apparatus, we should think the case above cited governed. But defendant, Blest & Emery Company, under contract with the owner, Conrad Construction Company, installed in each of the four buildings a complete steam-heating apparatus, consisting of boilers to generate the steam, mains and pipes to carry it through the building, and radiators to distribute the heat. The manner of the annexation to the realty of the apparatus, considered as a unit, its adaptability to the use to which the property was devoted, and the evident intent on the part of the owners to install it as a permanent accession to the realty, lead us to the conclusion that each complete steam-heating apparatus is a fixture and therefore realty. Potter v. Cromwell, 40 N. Y. 287, 100 Dec. 485.

"We cannot consider the radiators or the boilers as separate from the plant, of which they are an integral part, under the contract between the Blest & Emery Company and the owner. A contrary conclusion would lead to the result that, if the premises should be under contract of sale, the vendor would be entitled to remove the boiler from the cellar and the radiators from the rooms, and tender the building, so dismantled and unfitted for its use in housing tenants, in completion of his contract; or if the owner was a natural person, and should die intestate, his administrator could so strip the building before the heirs should take possession. We think that each adjunct or necessary appurtenance to the steam-heating apparatus had the same status as the apparatus in its entirety.

"The question is whether the whole is realty or personalty. If it is personalty, so is each of its parts, in the absence of a contrary intent on the part of the owner. If a door, whose hinges are attached to the wall with screws, or a window sash, sliding in grooves, or a key, which may be carried on the person, is realty, because of its adaptability to the use of the building and the presumable intent of the owner, then for the same reason is a heating plant, without which the premises are useless.

"It is, however, competent for the owner to preserve its character as personalty of any article annexed to the realty, providing it is not so incorporated with the realty as to lose its identity, or to be incapable of removal except by destruction or serious injury to the freehold."

PROPOSED STANDARD RULE FOR COMPUTING REQUIRED RADIATION

Final Report of Committee of National District Heating Association, as Presented at Pittsburgh Meeting.

In an effort to develop a rule for figuring radiation adapted for universal use, the National District Heating Association, through its Educational Committee, has drafted such a rule which is here given in the form in which it was finally presented at the association's convention this month in Pittsburgh.

A previous draft of the proposed rule was presented in THE HEATING AND VENTILATING MAGAZINE for September, 1918. Some members of the committee thought that the scientific method was too complicated, while others were of the opinion that further additions should be made to the rule. Table No. 4 of Rule No. 1, which gives the coefficients of heat transmission from the various types of radiation and pipe coils, is the latest addition to the proposed rules, and while they will probably not come into general use, they are added for the convenience of engineers who wish to go into complete details in the design of heating systems.

Suggested rules Nos. 2 and 3 are samples of simplified formulas which can be computed from the data in Rule No. 1 to fit any fixed local conditions.

The committee formulating the rules is headed by H. R. Wetherell, and includes Professor J. D. Hoffman, whose recommendations for figuring radiation (presented to the Engineering Department of the Illinois Public Utilities Commission and published in THE HEATING AND VENTILATING MAGAZINE for May, 1919) are practically identical with those recommended by the committee. *

RULES FOR DETERMINING SQUARE FEET OF RADIATION REQUIRED TO HEAT A BUILDING.

The following rule No. 1 is what is known as the B. T. U. rule for figuring radiation and can be applied to any condition of temperature differences or any type of heating system, either steam or water. It is recommended for use to member companies, heating engineers, architects and heating contractors.

Rules Nos. 2 and 3 are examples of rules which are known as simplified or short-cut methods of computing required radiation. They are made up from the factors in rule No. 1 and fit a certain type of building construction and temperature difference. When circumstances make it advisable, in the case of any particular heating company, to have in use a simplified formula, a rule similar to rules Nos. 2 and 3 can be made up from the factors in rule No. 1 to fit local conditions, with an average type of building construction.

Any room or space having an opening which may communicate with the rooms or space to be heated, whether radiation be installed or not in such rooms or space, must be considered in the measurements for space heated in either of the following ways, depending on the existing conditions:

1. If the unheated space is an active room and has a door or other opening which opens into the adjoining heated space and such doors or openings are left open the majority of the time, the entire space should be included in the measurements and sufficient radiation installed in the heated rooms.

2. If the unheated space is an inactive room and the doors or other openings are to be closed the majority of the time, the space and exposures of the unheated room should not be included in the measurements, but the walls adjoining the unheated and heated space should be taken as exposed surface in the measurements for the heated room. Basements and attics, which are used for storage purposes only, should not be considered as space to be heated.

Following are the three rules referred to above.

Rule No. 1.

Since the radiation in any room must emit sufficient heat to compensate for all heat losses from that room and since heat is transmitted by different building materials at different rates, it follows that:

* Due to a typographical error the formula for atmospheric steam heating systems in Professor Hoffman's report was given as H/0.208. This, as is obvious from the context, should be H/208.

$$\text{Radiation required} = \frac{\text{B. T. U. lost per hour from room}}{\text{B. T. U. emitted per sq. ft. of radiation per hour}}$$

$$R = \frac{H}{\text{B. T. U. per hour from radiation}}$$

$$R = \frac{H}{X \text{ (temp. diff. between contents of radiator and room temp.)}}$$

The value of X in the following computations is taken as 1.7 B. T. U. which is the coefficient of heat transmission from the type of radiation most generally used. See Table No. 4 for coefficients for various types of radiation and pipe coils.

Gravity straight steam systems having 1 to 3 lbs. pressure:

$$R = \frac{H}{1.7\ (220—70)} \text{ per season 3-lb. gauge} = \frac{H}{225.}$$

$$\text{Safe value} = \frac{H}{250}$$

Vapor systems, with individual traps on the return end of each radiation:

$$R = \frac{H}{1.7\ (212—70)} \text{ for steam at atmospheric pressure} = \frac{H}{241}$$

$$\text{Safe value} = \frac{H}{240}$$

Atmospheric systems, with open return and excess radiation for cooling surface:

$$R = \frac{H}{1.7\ (212—70) \div 1.20} = \frac{H}{200}$$

Water heating systems having an average of 170° water:

$$R = \frac{H}{1.7\ (170—70)} = \frac{H}{170}$$

$$\text{Safe value} = \frac{H}{165}$$

Theoretically, 1 B. T. U. will heat 55 cu. ft. of air 1° F., allowing for safety and simplicity in figuring. 50 cu. ft. is used, which makes the constant for one change 0.02 B. T. U. per degree difference in temperature.

In computing required radiation for well-constructed residences and office buildings, good practice allows one change of air per hour; well-constructed store buildings, two air changes per hour. For buildings of loose construction and those employing some method of forced ventilation, more air changes per hour will be considered, depending upon the existing conditions of building and ventilating system.

Table No. 1 shows the B. T. U. required to heat 1 cu. ft. of space at various temperatures and air changes.

Table No. 2 shows the B. T. U. losses per hour through 1 sq. ft. of various building materials with varying temperature differences.

Table No. 3 shows the percentage by which the B. T. U. loss obtained from table No. 2 will be increased when the exposure is other than southern.

To compute the radiation required in any room:

First—Compute the B. T. U. required to heat the air in the room by multiplying the cubical contents by the proper factor.

Second—Compute the B.T.U. lost through the doors and windows by multiplying their area by the proper factor.

Third—Compute the B. T. U. lost through the walls, floor and ceilings in the same manner.

For steam radiation (1 to 3 lbs. pressure) —Divide the sum of these results by 250 and the quotient is the number of square feet of straight steam radiation required.

For vapor radiation (with radiator traps) —Divide the sum of these results by 240 and the quotient is the number of square feet of vapor radiation required.

For atmospheric radiation (with extra cooling surface)—Divide the sum of these results by 200 and the quotient is the number of square feet of atmospheric radiation required.

For hot water radiation (water at 170° F.)—Divide the sum of these results by 165 and the quotient is the number of square feet of hot water radiation required

TABLE NO. 1.

No. Air Changes	B. T. U. 1° Difference	Difference in Temperature Between Rooms and Outside: 50°	60°	70°	80°	85°	90°
½	0.01	0.50	0.60	0.70	0.80	0.85	0.90
¾	.015	0.75	0.90	1.05	1.20	1.27	1.35
1	.02	1.00	1.20	1.40	1.60	1.70	1.80
1½	.03	1.50	1.80	2.10	2.40	2.55	2.70
2	.04	2.00	2.40	2.80	3.20	3.40	3.60
3	.06	3.00	3.60	4.20	4.80	5.10	5.40
4	.08	4.00	4.80	5.60	6.40	6.80	7.20

TABLE NO. 2.

	B. T. U. Difference K	Difference in Temperature Between Room and Outside 50°	60°	70°	80°	85°	90°
Windows, single glass, full sash area	1.25	62	75	87	100	106	112
Windows, double glass, full sash area	.60	30	36	42	48	51	54
Plate glass	1.00	50	60	70	80	85	90
Skylight, single glass, full sash area	1.10	55	66	77	88	94	99
Skylight, double glass, full sash area	.60	30	36	42	48	51	54
Wooden door, 1 in.	.40	20	24	28	32	34	36
Wooden door, 2 in.	.36	18	22	25	29	31	32
Brick wall, 8½ in. plain	.37	18	22	26	30	32	33
Brick wall, 13 in. plain	.29	14	17	20	23	25	26
Brick wall, 17½ in. plain	.24	12	14	17	19	21	22
Brick wall, 22 in. plain	.21	10	13	15	17	18	19
Brick wall, 27 in. plain	.19	9	11	13	15	16	17
Brick wall, furred and plastered, use .7 times non-furred.							
Stone wall, use 1.5 time brick wall.							
Concrete, 2 in. solid	.78	39	47	55	62	66	70
Concrete, 3 in. solid	.71	35	43	50	57	60	64
Concrete, 4 in. solid	.66	33	40	46	53	56	59
Concrete, 6 in. solid	.56	28	34	39	45	48	50
Frame wall (plaster, lath, stud, clapboard)	.50	25	30	35	40	43	45
Frame wall (plaster, lath, stud, sheathing, clapboard	.28	14	17	20	22	24	25
Frame wall (plaster, lath, stud, sheathing, paper, clapboard)	.23	11	14	16	18	20	21
Hollow tile, 2 in, ½ in, plaster, both sides	.41	20	25	29	33	35	37
Hollow tile, 4 in., ½ in. plaster, both sides	.33	16	20	23	26	28	30
Hollow tile, 6 in., ½ in. plaster, both sides	.28	14	17	20	22	24	25
Solid plaster partition, 2 in.	.60	30	36	42	48	51	54
Solid plaster partition, 3 in.	.50	25	30	35	40	43	45
Concrete floor on brick arch	.20	10	12	14	16	17	18
Fireproof construction as flooring	.10	5	6	7	8	9	9
Fireproof construction as ceiling	.14	7	8	10	11	12	12
Single wood floor on brick arch	.15	8	9	11	12	13	14
Double wood floor, plaster beneath	.15	8	9	11	12	13	14
Wooden beams planked over, as flooring	.17	9	10	12	14	14	15
Wooden beams planked over, as ceiling	.35	17	21	25	28	30	32
Lath and plaster ceiling, no floor above	.62	31	37	43	50	53	56
Lath and plaster ceiling, floor above	.25	13	15	18	20	21	22
Steel ceiling, with floor above	.35	17	21	25	28	30	32
Single ¾ in. floor, no plaster beneath	.45	23	27	32	36	38	41
Single ¾ in. floor, plaster beneath	.26	13	16	18	21	22	23

PERCENTAGE OF INCREASED RADIATION DUE TO HIGH CEILINGS.

Rooms 12 to 14½ ft. from floor to ceiling	3%
Rooms 14½ to 18 ft. from floor to ceiling	6%
Rooms 18 ft. and above from floor to ceiling	10%

TABLE NO. 3.

Percentage by which the heat losses given in Table No. 2 are increased if the exposure is other than southern:

Location	Heat Loss is Increased Per Cent.
N. E. or N. W. rooms	10-15
E. or W. rooms	5-10

TABLE NO. 4.

Value of X, coefficient of heat transmission from radiators:

Height of Radiators, Inches	1-Col.	2-Col.	3-Col.	4-Col.
20	1.93	1.85	1.75	1.64
23	1.89	1.80	1.70	1.59
26	1.86	1.76	1.66	1.56
32	1.79	1.69	1.59	1.49
38	1.74	1.65	1.55	1.45
45	——	1.60	1.50	1.40

Wall Coil	B.T.U. Per Sq. Ft. per Hour per Deg. Diff. in Temp.
Heating surface 5 sq. ft., long side vertical	1.92
Heating surface 5 sq. ft., long side horizontal	2.11
Heating surface 7 sq. ft., long side vertical	1.70
Heating surface 7 sq. ft., long side horizontal	1.92
Heating surface 9 sq. ft. long side vertical	1.77
Heating surface 9 sq. ft. long side horizontal	1.98
Pipe Coil:	
Single horizontal pipe	2.65
Single vertical pipe	2.55
Pipe coil 4 pipes high	2.48
Pipe coil 6 pipes high	2.30
Pipe coil 9 pipes high	2.12

Rule No. 2.

Rule No. 2 is to be used for computing the required steam radiation for a building, assuming a temperature of 70° inside, with an outdoor temperature of zero, with 13-in. brick walls or average frame construction. Windows, single-glass, set tight, and assuming 1½ changes of air per hour in the building.

$R = 0.008C + 0.08W + 0.35G.$

R = Required steam radiation with system using steam at 1 to 3 lbs. pressure.
C = Cubic feet of space to be heated.
W = Square feet of exposed wall surface.
G = Square feet of exposed glass surface.
Note—No allowance made for extreme exposures.

Rule No. 3.

Rule No. 3 can be used for computing required water radiation for a building, assuming a temperature of 70° inside, with an outdoor temperature at zero, with 13-in. brick walls or average frame construction. Windows, single glass, set tight, and assuming 1½ changes of air per hour in the building.

$R = 0.013C + 0.12W + 0.53G.$

R = Required water radiation with average temperature of water in system of 170° F.
C = Cubic feet of space to be heated.
W = Square feet of exposed wall surface.
G = Square feet of exposed glass surface.
Note—No allowance made for extreme exposures.

Canadian Proposal to License Engineers.

A proposed act has been drawn up by a committee of the Engineering Institute of Canada which shows how far the agitation for the licensing of engineers has progressed in the Dominion. The proposed act is cited as the "Engineering Profession Act," and is intended to include the entire engineering profession. All persons registered as professional engineers under the provisions of this act would constitute an Association of Professional Engineers of the province in which they had their business headquarters. Only such persons who are members of the association, or who might be licensed by the council of the association, could take and use the title of "professional engineer" or to practice as such. Five years of practice would be required to qualify a member without examination. Engineers of one province desiring to practice in another would require a license. This also applies to one not a resident of Canada, such licenses to be issued by the registrar of the association. Exceptions to the foregoing is made in the case of an engineer for a public service corporation or similar body in Canada, who may practice in other provinces than that of his residence without holding a non-resident license.

Every person registered under the act would have a seal containing his name and the words "registered engineer" together with the name of the province, which would be stamped on all official documents and plans.

The proposed act has been submitted to the members of the Engineering Institute of Canada for vote by ballot.

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COMING on top of the list published last month of terms characterized as misnomers, used in connection with heating and ventilation, an article in this number on "Air Washers Experiences," show another important instance of the misnaming of devices used in the heating trade. As the authors states, "the name (air washer) is a poor fit, since in many cases the removal of dirt is a secondary consideration and to 'wash' a gas is not exactly a happy expression for the process of moistening, or drying, or removing odors, or taking out dust."

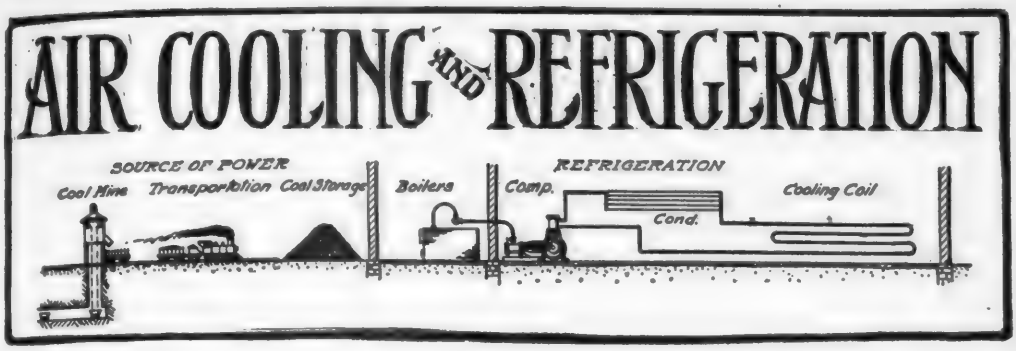
Our endorsement of the term "water heating" in place of "hot water heating" has drawn forth the comment from one correspondent that "with water heaters and water heating, there may be confusion with those used for plumbing service. These phrases would lead me to think of the latter unless they were qualified by the word, 'service.'"

The same correspondent mentions other terms that are inexact, to say the least. Steam and oil separators, he points out, do not separate steam or oil, but rather water and oil from steam. A grease extractor is correctly named since this extracts oil from the water in a boiler-feed line. Therefore, moisture and oil extractors might define the purpose of separators to better advantage.

Going a step further, he continues, "Why do we use 'extra strong' with pipe, but 'extra heavy' with fittings? Both are extra strong and extra heavy. Why is a buried anchor for a guyed steel stack called a 'dead man,' and when does a 'stack' become a 'chimney'? Fittings also should be more clearly defined. Couplings and valves are not fittings. Are pipe bends a part of the pipe line or are they fittings? Pipe bends should be extra heavy, but a certain contractor installed standard weight pipe bends since the specifications called for 'standard weight pipe and extra-heavy fittings.'"

Speaking of the term "radiator," the comment is made that "it is true that a radiator only radiates about 40% of the total heat emitted. However, a change in this would involve other similar terms, such as 'radiating surface' and cast-iron, Vento and wrought-iron 'radiation.' Radiators could not very well be called convectors, much less conductors. They are in reality heat transmitters, but this latter term applies to many things."

WITH THIS issue we complete the publication of the weather charts for the season 1918-1919. These charts have appeared regularly in THE HEATING AND VENTILATING MAGAZINE since 1906. For the benefit of our many new readers we would say that these charts are intended to cover the heating season only, including October and April. Their publication will be resumed in the Fall.



REFRIGERATION IN RELATION TO AIR CONDITIONING IN WAR INDUSTRIES

"It is only a few years ago when it was necessary to give a definition of the term 'air conditioning' to every person interested," declared J. I Lyle, general manager of the Carrier Engineering Corporation, introducing the subject, "Refrigeration in Relation to Air Conditioning in War Industries," before the American Society of Refrigerating Engineers at its recent annual meeting. Mr. Lyle gave, as the definition of air conditioning, "the regulation of atmospheric humidity, temperature and purity of the atmosphere in buildings."

"But a few years ago," he continued, "several refrigerating machine manufacturers felt that it was a waste of time to quote on refrigeration in connection with air conditioning apparatus, because they looked upon air conditioning as a dream or idea which was not practical and which would rarely, if ever, be installed. It is true that the cost of air conditioning in those plants requiring refrigeration was great, and that many propositions were turned down by prospective customers because of what they termed an excessive price. Nevertheless, air conditioning has proven itself to be profitable in many industrial plants, and has become indispensable in many of the industries connected with war work.

AIR CONDITIONING IN WAR INDUSTRIES.

"It is in reference to the latter that I wish to speak. The company with which I am connected has during the last three and a half years installed 2,630 tons of refrigeration in connection with air conditioning apparatus ih war-essential industries. While this is a greater total than that used in connection with peace-time industries, I venture to prophesy that it will not be very long before the peace requirements for air conditioning will double this tonnage.

"Of the 18 fuse-loading plants that have been in operation in this country and Canada, we have equipped 16 with air-conditioning apparatus, totaling 1,085 tons of refrigeration. The black powder used in fuses is very hygroscopic, and not only must the blending be done with great precision, but the atmosphere to which the powder is exposed, the drying of the powder and conditioning it previous to loading the fuses, is of the greatest importance in securing accuracy in firing. The freedom from explosions and flashes in the loading room is dependent upon the atmospheric condition, as the humidity must be sufficiently high to prevent static electricity.

It is most important to maintain a temperature and humidity that will prevent perspiration on the hands of the operators, for the reason that the least moisture left by the hand on the, dies will cause the powder to adhere to it, and when put into the press is almost sure to flash, and liable to cause a fire or explosion. Dust, especially the floating powder, must be eliminated and prevented from accumulating on any part of the equipment of the plant. Every precaution must be taken to prevent flashes, and also the transmission of fire from one room to another. The rooms themselves are made so that they may be kept scrupulously clean, direct radiation or other piping or obstruction that would be hard to clean being eliminated.

"When it is considered that a fuse must be capable of being set to fire within 16 ft. of the muzzle of the gun, with a muzzle velocity of 1,700 ft. per second, and still must not explode within the gun, the deli-

cacy of the operation may be appreciated. One fuse out of twenty set to function at 20 seconds that varies more than five-tenths of a second will cause the rejection of the whole lot of two thousand.

"At the Russian proving ground at Lakehurst, N. J., 30 shells were tested for a distance of 3.31 miles. The powder used in twelve of these fuses was subjected to a relative humidity of approximately 20% above that to which the other eighteen were subjected. The average firing time of the twelve was 0.35 seconds longer than the average of the eighteen.

CONTROL OF ATMOSPHERIC CONDITIONS WITHIN CLOSE LIMITS.

"The atmospheric conditions held in these plants have been such that those not acquainted with the development of the art within the past few years would not consider them possible of being attained. In the majority of these plants the several loading rooms are constructed within a large room so there is no outside exposure, although light is well provided by skylights and windows. Of course, the proper heating and ventilation of the large room materially reduces the fluctuation that would otherwise have to be overcome by the air conditioning apparatus in the small rooms.

USE OF INDIRECT AIR CONDITIONING SYSTEMS.

"In all of these installations the indirect system of air conditioning has been used with a central fan and dehumidifier and refrigerating equipment, and with separate indirect heaters located in the air supply duct near each room. In these plants the maximum requirements on the air conditioning plant occurs during the hot, humid weather of summer, and during such times nearly all of the air used is recirculated to obviate the necessity of condensing the enormous quantities of moisture that would be necessary if all outside air were used.

"In the majority of these installations, a self-contained type of dehumidifier is used. The air to be treated passes in through a water spray in the upper chamber where it is washed and the absolute humidity fixed. The water overflows through water seals to flooding troughs located in the lower chamber. From these troughs it spills over the direct expansion coils into the settling tank below, from which it is again pumped through the sprays. In winter the water is heated by an injector water heater. A dewpoint absolute humidity control regulates the temperature of the air leaving the dehumidifier by varying the water temperature.

"The ducts, both supply and return, are insulated with 2-in. cork board, laid in pitch, and covered with canvas, while on the apparatus the same insulation with ½-in. cement plaster is used instead of canvas.

"The automatic humidity control in summer operates a damper in the air supply duct to the room, while in winter it operates the steam supply to the indirect heaters. The temperature is regulated in these rooms to within one degree, and the relative humidity to 2 %.

"The refrigerating machines in the larger installations, 40 to 200 tons, have been of the vertical two-cylinder, single-acting type, operating at the rather high ammonia suction pressures of 35 to 45 lbs. The condensers have been of the double-pipe type.

CONDITIONING THE AIR IN CONNECTION WITH MANUFACTURE OF AMMONIA NITRATE.

"A second use of refrigeration in munition plants has been in connection with the fractional crystallization process in the manufacture of ammonium nitrate. The largest air conditioning plant, we believe, that was ever constructed, has been installed in the United States ammonium nitrate plant, Atlas Powder Co., agents, at Perryville, Md. It is unnecessary to describe this process further than to say that it has made possible the manufacture of ammonium nitrate from materials that were readily obtainable, and the construction of the plant was such that quick production was possible. The contract for this $6,000,000 plant was made during the latter part of February, 1918, and the manufacture of ammonium nitrate was begun on July 4 and shipments were made on July 11. At the time the armistice was signed, the plant was turning out 250 tons per day. We believe there have been very few, if any, plants constructed for the manufacture of munitions that have produced quantities of materials in such a short time.

"The liquor from which the crystals are extracted enters the crystallizing house hot, and the first cooling, amounting to 1,000 tons of refrigerating effect, is accomplished by simply using double-pipe coolers and circulating water at a temperature lower than that of the liquor, but higher than the critical temperature of crystallization of the liquor. These cooling coils were manufactured with a spiral division in the annular space between the two pipes so as to maintain a very high velocity of the liquor, which thus assists in preventing crystallization that would clog up the pipes. From the cooling coils, the liquor

goes into large, flat, shallow pans where it is cooled to the critical temperature, the ammonium nitrate forming in long needle crystals. In order to prevent crystallization of other salts contained in the liquor, it is necessary that the liquor be promptly drawn from the pans at a given temperature, after which the crystals are removed from the trays. The liquor drawn off is returned to the process to be recirculated.

"Due to the very narrow limits between the temperature at which the ammonium nitrate begins to crystallize and the temperature at which the other salts begin to crystallize, it is imperative that the cooling be done by air surrounding the tank rather than by a cooling surface. The humidity of the atmosphere must be maintained rather high in order to prevent evaporation. Both the temperature and humidity of the atmosphere must be accurately and automatically regulated within very narrow limits. The air conditioning equipment for this particular plant cost approximately $600,000. The refrigerating apparatus consisted of four vertical, single-acting, two-cylinder York compressors, driven by horizontal Corliss engines, the machines operating at a suction pressure of about 40 lbs. and a head pressure of about 165 lbs., each developing 175 tons of refrigeration, or a total of 700 tons. The condensers were of the double-pipe type, 1¼-in. and 2-in. pipes, 12 pipes high. As high water temperatures were expected and water was readily available, the condensers were equipped with double water headers and supplied with large quantities of water. Head pressures of from 165 to 170 lbs. were regularly maintained with condensing water at 82° F. The cooling medium for treating the air was salt brine, which is cooled in six shell-and-tube type coolers. Each system of brine circulation was open at five points, four dehumidifier tanks and one brine concentrating tank. At these five points, brine was received in constantly varying volumes and a balance in levels maintained by means of automatic relay float regulators.

"The air conditioning equipment consisted of eight sets of dehumidifiers and fans, all electrically driven. The pumping is done by 23 centrifugal pumps, all direct connected to electrical motors.

"Among other industries using air conditioning apparatus with refrigeration are to be mentioned the star shell plant of the Navy, meat packing houses, oleomargarine factories, creameries, pharmaceutical preparations, Government Coastwise Telephone Exchange at Norfolk, non-scatterable glass, also a recoil assembly plant making French 75 m. m. guns."

Current Heating and Ventilating Literature.

Under this heading is published each month an index to the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the articles mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

EQUIVALENT TEMPERATURES, STEAM-HOT WATER.

Equivalent Temperature of Guaranteed Steam and Hot Water Heat, Henry N. Dix. Am. Architect, vol. 115, no. 2,254, Mar. 5, 1919, pp. 358-360, 6 figs. Formula and charts. 40c.

FOUNDRY VENTILATION.

Foundry Ventilation. Iron Age, vol. 103, no. 10, Mar. 6, 1919, p. 610, 3 figs. Effect of roof design and heating systems on air circulation. 40c.

HEATING.

Community heating of dwellings; economy, cleanliness and convenience of central station heating as compared with house furnaces—heating as the prime object and electric currents as the by-product. (Municipal Journal and Public Works, April 5, 1919. p. 249-252.) 60c.

INDUSTRIAL BUILDINGS.

The Mechanical Equipment of Industrial Buildings—II. Charles L. Hubbard. Power, vol. 49, no. 10. March 11, 1919, pp. 362-365. Remarks on selections of type of prime mover, systems of power distribution and methods of heating and ventilating. 20c.

TEMPERATURES, INDOOR AND OUTDOOR.

Tests for Heating Plants in Mild Weather, Henry N. Dix. Metal Worker, no. 2,360, Mar. 21, 1919, pp. 365-367, 7 figs. Charts of temperature indoors with varying outdoor temperatures. 20c.

VACUUM HEATING.

Care of Heating and Ventilating Equipment—VIII, Harold L. Alt. Power, vol. 49, no. 9. March 4, 1919, pp. 306-308, 11 figs. Vacuum-heating systems. 20c.

Survey of Building and Loan Associations.

Returns made by several thousand building and loan associations to a questionnaire sent out by the Department of Labor show that more than 40% of the building associations have not sufficient funds to meet the desirable applications for loans that are coming in for construction activities. The movement to establish Federal Home Loan Banks, which has been proposed as a solution of the problem, has been approved by a majority of the associations. The shortage of houses at the present time is estimated at something like 1,000,000.

WRINKLES

Common Errors in the Installation of Propeller Fans with Resulting Short Circuits.

Exhaust fans of the propeller or disc type are often installed near some inlet or outlet so that the air taking the line of least resistance short circuits, as in Fig. 1 and 2, from window to fan.

Where ventilation is desired, the air should take the long circuit across the room and the fan should discharge from the room only, the windows in the immediate vicinity of the fan being kept closed.

Another case of short-circuiting is within the fan itself, as shown by the curved arrows in Fig. 3. The fan is exhausting from the end of a duct in which a number of turns restrict the flow of air, also the duct is abruptly reduced directly behind the fan. Since the fan will endeavor to discharge more air than can be passed through this reduction at necessary increase in velocity,* a vacuum will be produced at "A." making the pressure on the discharge side of the fan greater than on the exhaust side. Air will then flow from the outside back around the center of the fan at which point the blades are narrower and slower, with consequent less propelling power than at the tips. Short circuiting or churning of the air will continue so long as the inequality of pressures exist. For these conditions, but with fan discharging into the duct, an opposite effect would be produced.

Propeller fans are built for moving air against slight resistances; the more direct the outlet the better will be the result. The path of the air should be definite and unobstructed. Passage of air through the fan itself creates but a low resistance, but with a high external resistance the discharge will be small, the work done being in overcoming friction and eddies about the fan. It sometimes happens that wind pressure on the discharge side of a propeller fan will cause a backward flow through its centre, completely reversing the current for the time being particularly if

*Work required to impart motion to the air increases as the square of the velocity.

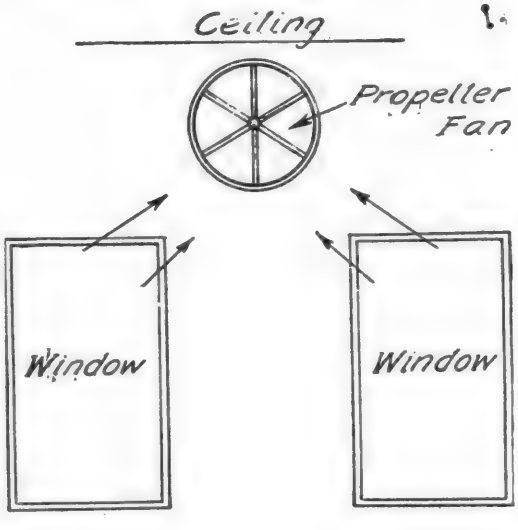


FIG. 1—EXAMPLE OF AIR SHORT-CIRCUITING WITH PROPELLER FAN.

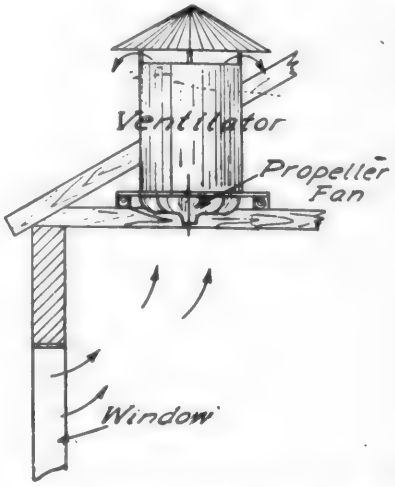


FIG. 2—ANOTHER EXAMPLE OF AIR SHORT-CIRCUITING WITH PROPELLER FAN.

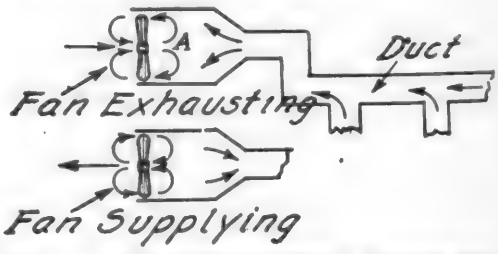


FIG. 3—AIR SHORT-CIRCUITING WITHIN THE FAN ITSELF.

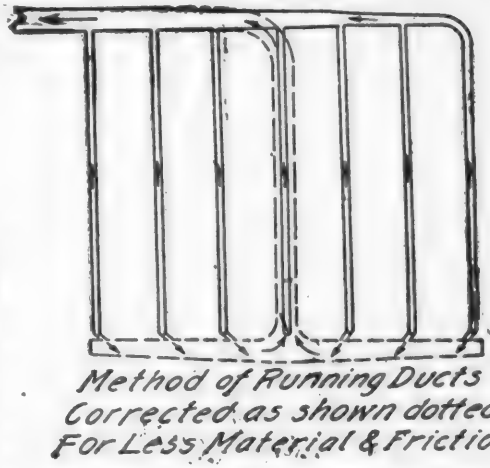
the fan is too large for the required work and consequently is run at a low velocity. A remedy without increase of speed is to stop up the fan centre.

Economy in Duct Construction.

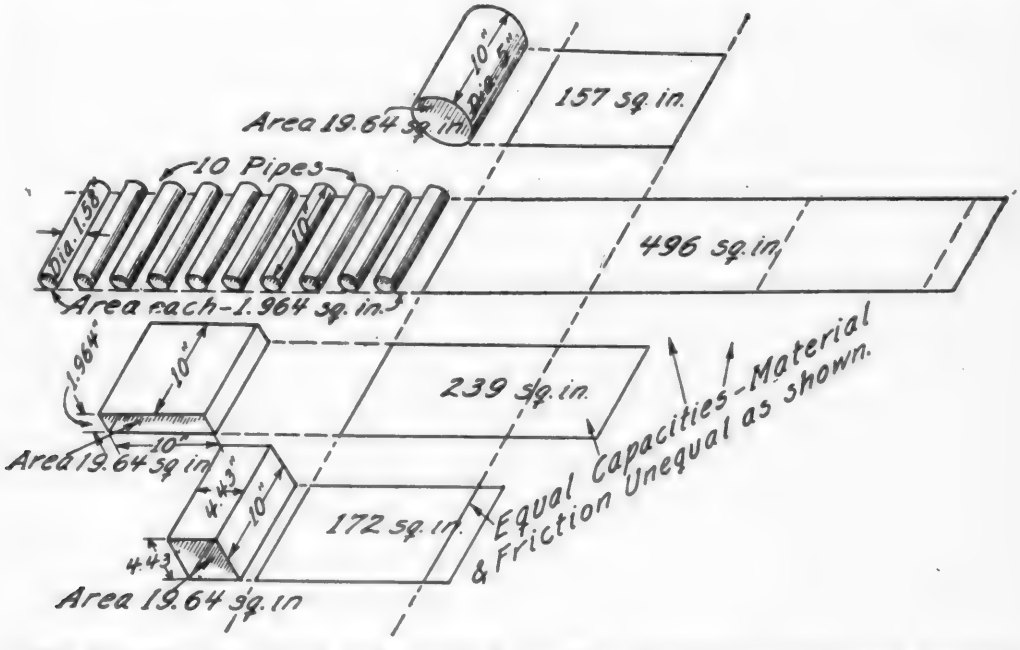
The accompanying sketches are made to show the required shapes of ducts for economy in the use of sheet metal, with consequent lessened friction to the flow of air.

Local conditions often dictate the shape to be used for a duct, such as in schoolhouse work, where the ducts are usually run on the ceiling of the basement so as to be economical of space and headroom. Loss due to friction increases four times if the velocity is doubled since the friction increases with the square of the velocity of the flow. This would make low velocities desirable if it were not for the greater cost of large size ducts as required to pass a given quantity of air at a lower velocity. This cost also exceeds the saving in power. Loss of power increases with the cube of the velocity. However, economy of power for steam engine drive is not important if the exhaust is used in the heating system. On the other hand there is a pratical minimum pressure and flow beyond which ventilation would be insufficient.

The sketches show the area of metal required for various shapes of ducts passing the same amount of air (neglecting friction) with the waste of material and resulting excess friction. The round duct is best, a square duct better than a rectangular one. Preference should be given to one large duct rather than to a number of smaller ducts whose combined area is equal to the large duct. This is clearly shown in the sketches. Round ducts are stronger and are easier to clean. Square or rectangular ducts of large size should be reinforced externally to increase



ARRANGEMENT FOR REDUCING MATERIAL AND FRICTION IN AIR DUCTS.



AREA OF METAL REQUIRED FOR VARIOUS SHAPES OF DUCTS PASSING SAME AMOUNT OF AIR.

their strength and prevent collapse. This is a better method than increasing the thickness of the metal forming the duct.

In order to reduce the friction, low velocities are sometimes used, but this method only serves to increase the sectional area of the ducts and therefore the friction surface. Friction is often overcome more advantageously by increasing the driving pressure.

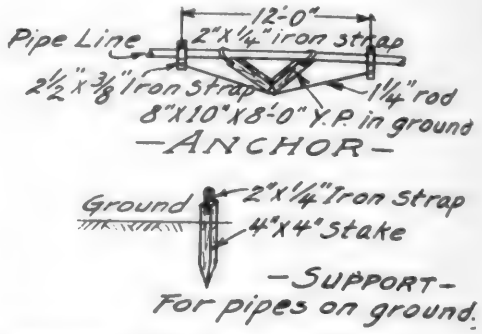
In schools, the supply of air to each room is governed by the number of pupils and the advisable travel of air through the registers, the latter to eliminate objectionable drafts. The area of register faces is obtained by dividing the volume per minute by the velocity of flow per minute. Working backwards, the velocities are increased up to the fan. This method brings about an increase in the size of the ducts in which the velocities are low as in those remote from the fan. However, these are the smaller ducts in which the friction would otherwise be greatest. Further, with high velocities there would be considerable noise of air travel at the registers. The backward increased velocity methods helps to maintain a more uniform delivery of air throughout the system. It converts the velocity pressure into useful static pressure to compensate for the increase of friction in the ducts of smaller size. Downdrafts are also prevented through any register and flue, since the volocity in the duct at the base of a flue is higher than in the flue itself.

Permanent and Temporary Pipe Supports

Where permanent pipe lines are run they should be supported at frequent intervals with rigid supports equally as permanent as the lines they support. This seems obvious, but one has only to glance over a number of old installations in order to find that the matter has not been given the proper attention. At the time of installation no doubt such supports had the appearance of strength, but if steam lines are to continue to function properly without air-binding pockets, they must be proportioned or rather secured for the weight of a man, for use as shelves and other forms of mechanical injury. Pipe lines in the cellars of our homes are often used for the storage of boards and other materials between them and the ceiling.

With temporary pipe lines, economy in first cost consistent with efficiency is of prime importance. Temporary work often becomes more or less permanent through lack of funds for projection of the originally-contemplated permanent installation and, for this reason, all work should have a certain degree of permanency.

Steam pipes supported as shown by sketch will stand up for a number of years. This is a support for temporary exterior steam lines of considerable run. As shown, a 4 in. by 4 in. stake is cut and provided at the top with an iron strap



SUPPORT FOR TEMPORARY EXTERIOR STEAM LINES.

bent to enclose the pipe. Stakes should be driven at 10-ft. intervals below frost line or to proper bearing according to the soil, keeping their tops at suitable height for pitch and freedom from snow or water. Pipes supported on poles are less liable to injury but are the more difficult to repair. Pipes supported as in the sketch may be cheaply insulated by enclosing in old stove pipe filled with saw dust. An anchor for temporary exterior steam lines is also shown.

For temporary conditions, the return end of a heating coil or other steam-using apparatus whose condensate is to be wasted, may be extended to the outside with a discharge pipe having open end buried for a few inches in the earth. This avoids the use of a steam trap, the resistance of the earth being sufficient to prevent the free passage of the steam into the atmosphere while affording ample drainage for the condensate. If the discharge is from overhead with sufficient headroom, then a simple loop seal in the discharge pipe will be all that is necessary.

Conditions Affecting Air Change

Air leakage is a variable or theoretical quantity. It is difficult to determine with accuracy, being dependent upon the thickness of the walls, the material and care used in their construction, the looseness of windows and exterior doors, direction of prevailing winds and, in particular, the

number of windows, how well they are fitted and constructed and the type of construction. In small rooms, with a large window area, the leakage would be greater than in large rooms with a less proportionate area of window surface. Unusual conditions increase the change of air so that judgment must be relied upon to a great extent in determining the amount of heating and ventilation required. The usual assumption for the average room of less than 10,000 cu. ft. is one air change per hour. Weather-stripped windows are a material help in preventing air leakage.

Often a heating system is inadequate in a building located in an exposed place. Wind increases loss of heated air by creating a pressure on one side of a building with resulting partial vacuum on the other side, air being blown in on the windward side and drawn out on the lee side. This is increased if the rooms on both sides connect so as to permit a movement of air, the lee side being overheated, the windward side without sufficient heat. Wind pressure is greatly increased by the height of the building, in particular with respect to adjacent buildings of less height. In tall buildings, elevators and stairs increase the problem in the same way as would be effected by a tall chimney. As a consequence the lower floors require more heat. Wind pressure may increase the degree of ventilation by from two to six times or even more.

With the same shape and construction, the larger a room the slower the air change since its surface increases as the square of the room while the capacity increases as the cube. With an increase in capacity of eight times the surface is increased but four times. This will be readily seen by referring to the sketches showing two square rooms arranged for comparison.

In Fig. 1, the smaller room is shown in full with each side 8 ft. long and 8 ft. wide, or an area of 64 sq. ft., which times six equals 384 total sq. ft. of surface; while the larger room is shown in dotted with each side 16 ft. long and 16 ft. wide, or an area of 256 sq. ft., which times six equals 1,536 total sq. ft. of surface. The number of equivalent sides or squares (24) in the larger room, also the total surface, has been increased four times over that of the smaller room. The total surface is not all exposed surface; however, the latter increases according to the same rule. In Fig. 2, the smaller room (shown in full) being 8 ft. high, has a capacity of (eight times 64 sq. ft.) 512 cu. ft., while the larger room (shown in dotted) has a capacity of (sixteen times 256 sq. ft.) 4,096 cu. ft. The number of equivalent square or rooms in the larger room, also the total cubic feet or capacity, has been increased eight times over that of smaller room.

It will be evident from what has been said that ventilation in large rooms may be insufficient if not provided for by other than natural leakage even with the large amount of air space per person.

An open fireplace acts more as a ventilator than as a heater and with a bright fire may increase the ventilation as much as ten times.

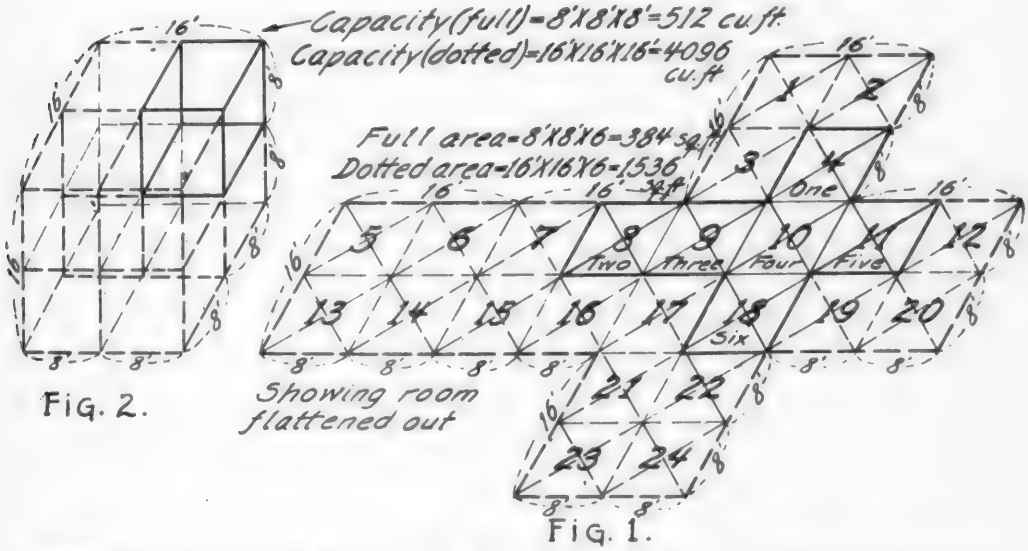


Fig. 2. Fig. 1.

DIAGRAM ILLUSTRATING EFFECT OF AIR LEAKAGE IN SMALL AND LARGE ROOMS.

Leakage may also result (other than by cracks and crevices) by gradual diffusion of air through the walls. If all the crevices were stopped up leakage of air would still take place. This is increased by the height of the room and increase of temperature difference between the inside and outside of a wall. In rooms of average height this is a minor point as compared with a slight breeze, though in other cases the air leakage may be increased threefold by a difference in temperature of twenty degrees as compared with an equal temperature on both sides of the wall.

THE RECONSTRUCTION ERA

Government Collecting Reconstruction Information.

The United States Council of Defense has announced its readiness to place at the command of the busines world the information contained in the mass of data which has been brought together, classified, indexed and partly digested by its Reconstruction Research Division. The division, for instance, has charted all the Federal official bodies that have a point of contact with demobilization or reconstruction and has information as to the plans and accomplishments of each such bureau. The division also has access to every important report of foreign reconstruction activity proposed or acomplished. In this way the council opens to the business public probably the largest and most complete assembly of up-to-date reconstruction information obtainable. Inquiries are invited, addressed to the Reconstruction Research Division Council of National Defense, 18th and D Streets, N. W., Washington, D. C.

Prices During the War and the Readjustment Period.

A bulletin published by the Information and Education Service of the Department of Labor shows in an interesting manner the maximum rise of the price level in the United States and other countries, the fall of the price level during the period of readjustment and a comparison of the rise in building materials and other commodities. The course of commodity prices during the present period of readjustment is based on the quotations of wholesale prices of 313 commodities. The small arrow half way up in Fig. 2 indicates the average index for the year 1913. In connection with Chart No. 3, it is pointed out that by the end of 1918 the pre-war dollar, as expressed in terms of farm products, had shrunk to 46 cents; as expressed in terms of lumber, it had fallen to 58 cents; in terms of building materials (not including steel), it fell to 54 cents. A composite index for all building materials, including steel, as well as lumber and the rest, would show an increase of 93% over the

CHART I.

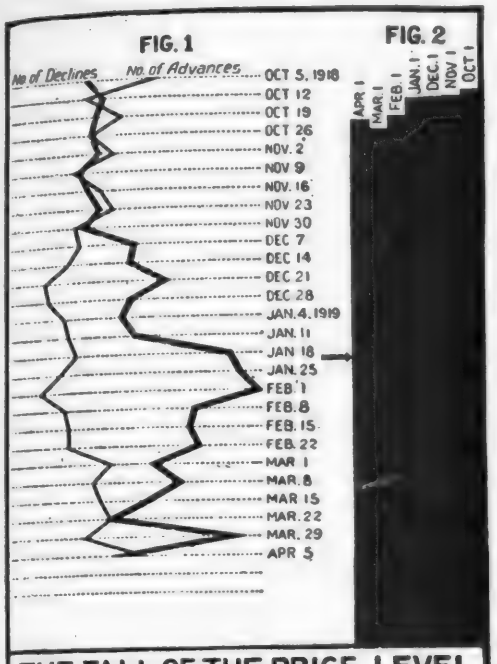


CHART 2.

pre-war period for the last quarter of 1918. At the present time the index number would be 189.

The bulletin concludes with the statement that "it appears that the wisest business men are those who decide now to go ahead with the construction of buildings and the production of goods; the need for both forms of activity are more imperative now than ever before."

The Government's Policy in the Sale of Surplus Property.

Assurance has been given to the business world by the Director of Sales of the Surplus Property Division that he would, in all cases, consult with a representative committee from the manufacturers in each industry before deciding upon the best method of disposing of materials affecting that industry. From now on it will be the policy of the Director of Sales to give out for publication as rapidly as possible exact information concerning the surplus property on hand and the plans which have been made for its disposition. There is still a lack of complete and detailed inventories of many of the most important stocks of materials, but every effort is being made to get this information.

Chamber of Commerce Report on the Wheat Crop.

A winter wheat crop which is estimated to run close to 900,000,000 bushels, an increase of nearly 33% over the record-breaking crop of 1914, and an acreage never before equalled, is forecast in a report on the condition of winter wheat issued by the Chamber of Commerce of the United States through its Committee on Statistics and Standards.

Government Engineering Courses Popular.

According to a report published by the Federal Board of Vocational Education, one of the most popular divisions of education made available to disabled soldiers

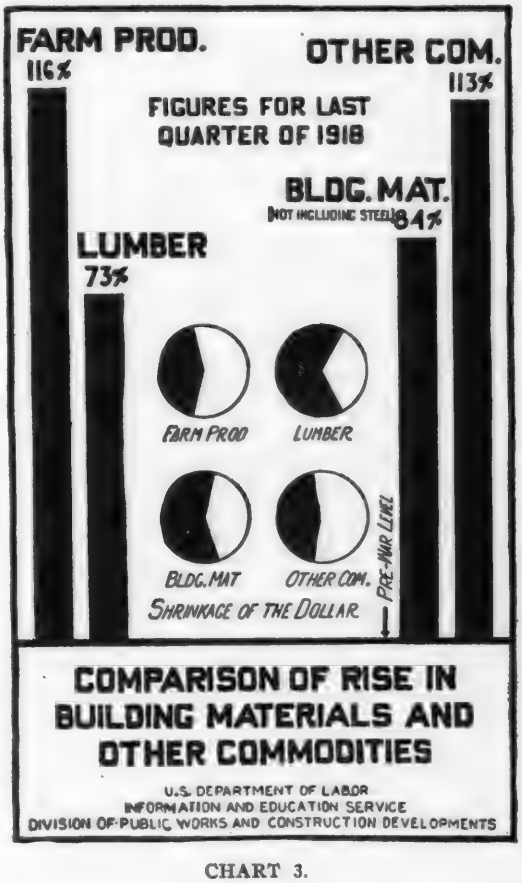


CHART 3.

is that of engineering, in the various branches of which there are now 178 students. Several of the leading universities and engineering schools are being utilized in this connection.

Plans of the Working Conditions Service for Promoting Industrial Health and Safety.

The fact that heating and ventilation is recognized by the Working Conditions Service of the Department of Labor as one of the vital factors in promoting industrial health and safety lends particular interest to the plans of this Service which are described in a recent bulletin on "Treatment of Industrial Problems by Constructive Methods." The authority of the Working Conditions Service is wholly advisory but it is anticipated that the establishment of certain standards, which can be presented to the manufacturers as means for increasing the efficiency of the workers, will be widely adopted as business propositions.

At present the Service includes a Division of Industrial Hygiene and Medicine, a Division of Safety Engineering and a Division of Labor Administration. The first-named Industrial Hygiene Division is the one that is of the greatest interest to heating engineers. The personnel of this division is composed not only of industrial physicians, hygienists and sanitarians, but highly-specialized engineers familiar with problems of light, ventilation, and similar factors. According to the plans of this division an effort will be made to establish a national programme to promote industrial health, covering such points as dust, fumes, poisonous work materials, bad air, bad lighting, dirt, and inadequate sanitary provision.

The division's researches will cover such items as general hygienic conditions in industries in order to determine wherein existing conditions both within and without plants comply with sanitary requirements, specific occupational diseases and poisonings to ascertain cause, effect and prevention, and, third, physiological requirements of various occupations as the basis for developing methods of proper placement of workers with regard to physical ability.

For those industries which are under governmental control it offers to install and supervise departments of health and sanitation, to introduce and standardize records and reports and direct researches into any actual or alleged hazard, outlining the necessary engineering and prophylactic measures to reduce the seriousness of such hazards or eliminate them entirely, that will enable the management to know health conditions and results of policies and methods.

To industries under private control, consulting service is furnished to improve hygienic conditions and medical service. Upon request the division will make a health survey of the plant, make recommendations to the management, and, if desired, supervise the installment of recommendations.

Employers Urged to Co-Operate in Placing Soldiers and Sailors

Employers in the New York district are urged again to list all jobs at the Re-Employment Bureau of New York City for Soldiers, Sailors, and Marines, which is being maintained at 505 Pearl Street, New York. This bureau, it is stated, has hundreds of untrained, unskilled men that need work and employers are asked to give these men a chance to become skilled workmen As a rule, the returning soldiers are eager to better thier station in life and it is argued that unless this ambition is capitalized immediately by placing them in productive employment, it will disappear and with it the possibility of great gain to the men, employers and society. The bureau reports a scarcity of skilled labor in many lines which, it states, is likely to be more acute within a few months.

Seven Million Workers Need Training.

Upward of 7,000,000 workers in this country have not had the opportunity to become properly trained in their tasks, according to the U. S. Training Service of the Department of Labor, whose function is to promote industrial training in manufacturing plants. The system of training which the Training Service advocates is that of upgrading workers by extending their knowledge of processes and increasing their skill. These and other facts equally pertinent in reconstruction problems are set forth in a vest pocket bulletin entitled, "Seven Million Candidates for Training," issued by the Training Service. Interested manufacturers may obtain expert advice from the Training Service in planning their training departments and in preparing training courses by addressing the U. S. Training Service, care of the Department of Labor at Washington.

MODERN PRACTICE IN VAPOR HEATING

EDITOR'S NOTE: *For the purpose of this series of articles, a vapor, vacuum, vapor-vacuum, vacuum-vapor, atmospheric, modulated or thermograde system of heating will be considered as any system in which the steam pressure ordinarily carried is practically at atmosphere or slightly below or in which the returns are open to the atmosphere and where no pump or other positive mechanical device is employed to pull back the returns.*

XI—THE TRANE SYSTEM.

A desirable feature in any heating system is simplicity of operation, especially in cases where the operation is in the hands of the householder or janitor. The advantage of simplicity may fairly be claimed for the Trane system which is marketed by the Trane Co., La Crosse, Wis. A typical layout of this system is shown in Fig. 1. The specialties used consist of a vapor regulator for controlling the draft, a receiver and air exhaust valve to separate the air and return the water of condensation to the boiler, and with an ounce pressure gauge for the boiler. These specialties, together with graduated vapor valve provided for the radiator inlets and special return fittings or thermo traps for the radiator outlets, complete the system.

The vapor regulator, shown in Fig. 3, has been designed with particular reference to securing a sensitive and quick acting device. The regulator is connected into the steam dome or into the supply pipe on top of the boiler, and chains run from the end of the lever arm to the draft door and to the check draft in the smoke pipe. The pressure in the boiler operates on the body of water in the bottom of the regulator which, in turn, forces up the large diaphragm connected to the lever arm, closing the draft as the pressure increases and opening it again as the boiler pressure goes down. A weight is provided on the lever arm which can be set to maintain any desired pressure in the boiler. It can be adjusted to operate at a small fraction of an ounce.

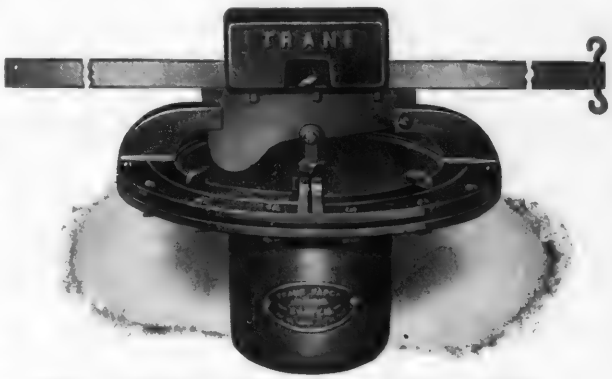


FIG. 2.—VAPOR REGULATOR USED WITH TRANE SYSTEM.

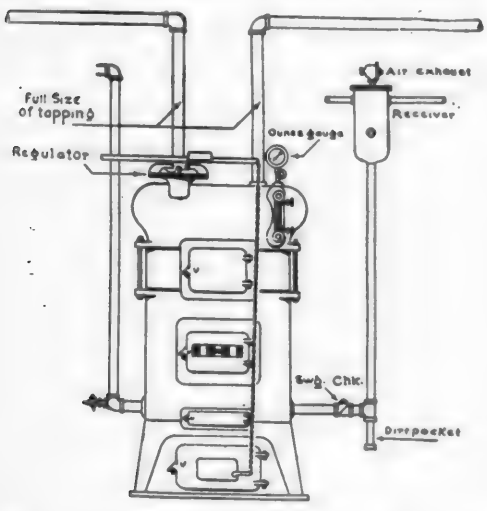


FIG. 1.—ARRANGEMENT OF BOILER CONNECTIONS FOR TRANE SYSTEM.

The receiver (Fig. 4) is primarily a safety device, its function being to receive the air and water of condensation coming back from the radiators, to vent the air from the systems without permitting the escape of steam, and to return the condensation to the boiler under all operating conditions.

Under ordinary conditions of vapor heating, the air will be vented and the water of condensation will return to the boiler by gravity. If the boiler pressure should happen to be increased, the water of condensation cannot return to the boiler against this pressure. Under these conditions, the condensation collects in the receiver until there is a sufficient amount to raise the float. When this occurs, it closes the air vent to the atmosphere, sealing the system, and the difference in pressure between the boiler and receiver then becomes so small that the water will flow back to the boiler. This operation is automatic and continues as long as the pressure in the system is higher than that

ordinarily required. The thermo trap at the top of the receiver acts as an exhaust valve allowing the air to escape from the system and preventing the escape of steam.

The construction of the radiator inlet valve (Fig. 5) differs from other types in

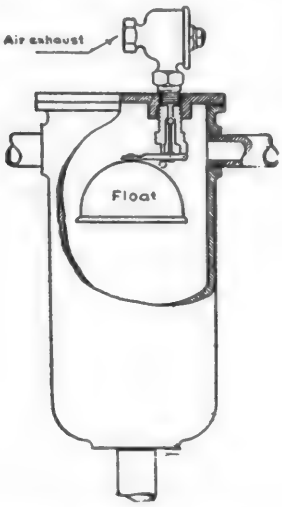
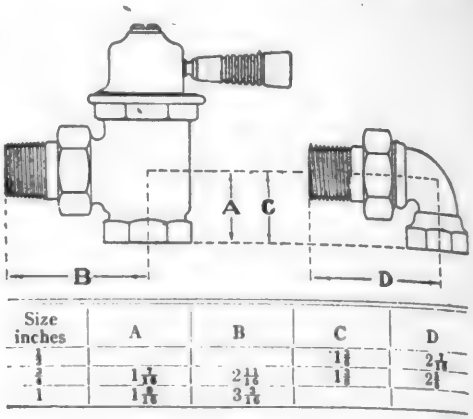


FIG. 3.—RECEIVER OF TRANE SYSTEM.

that opening the valve lifts the disc from the seat and at the same time raises the shell or sleeve gradually past a port in the side of the valve so that the supply of vapor to the radiator is proportioned at all times to the position of the valve handle. The sleeve rises and revolves at the same time, giving a revolving motion, serving to keep the sleeve clean and preventing scratching or scoring of the valve body. This valve has a pointer or indicator, revolving on a brass dial set into the top of the valve, permitting an accurate graduation of the steam supply.



Size inches	A	B	C	D
½			1⅛	2 7/16
¾	1 7/16	2 11/16	1⅛	2⅛
1	1 13/16	3 3/16		

Under ordinary conditions the special return fitting shown in Fig. 6 is used on the return end of radiators. This, it will be noticed, has two separate openings for the escape of air and water from the radiator. Special importance is attached by the manufacturers to this arrangement as it provides for the quick escape of air and water from the radiator, permitting the system to heat up quickly, and also providing a high factor of safety for the system.

Where special conditions are encountered a thermo trap is used in place of the return fitting. The thermo trap may also serve, where necessary, as an air exhaust valve on the receiver.

The hot water type of radiator is used with this system, tapped top and bottom, opposite ends for first floor and the same end for upper floors. The return should

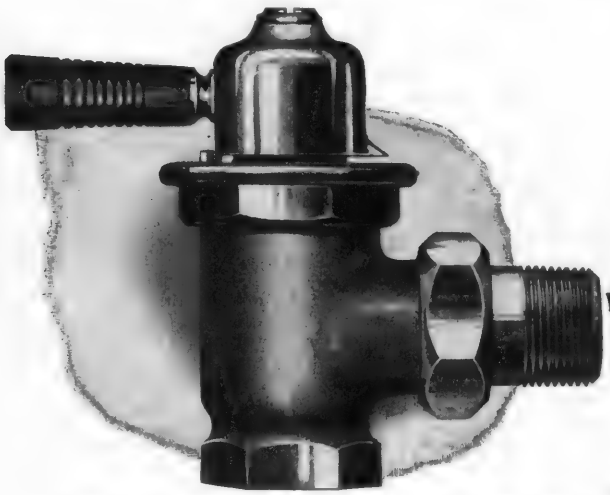


FIG. 4.—TRANE RADIATOR INLET VALVE.

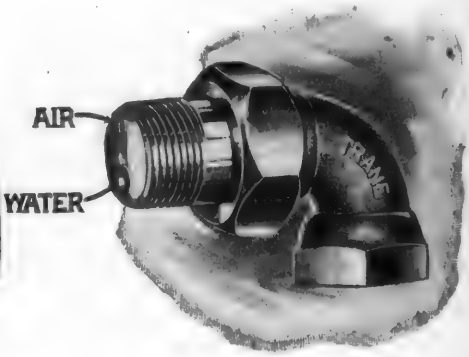
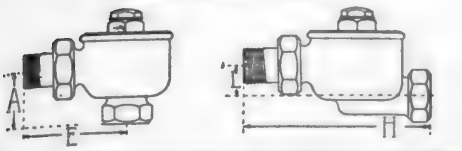


FIG 5.—TRANE RETURN FITTING USED AT RETURN END OF RADIATOR.

Trane Thermo Traps



Style	Size Inch	Cap. Sq. Ft.	Dimensions A.	E	L	H
Angle	½	175	1¼	3	...	...
Straightway	½	175	...	...	¾	4¼
Angle	¾	500	1¼	3¼	...	...

have eccentric bushings. When return fittings are used the radiators should be bushed for top and bottom connections as follows:

20 sq. ft. and under.....¾ in. x ½ in.
21 to 64 sq. ft.....¾ in. x ¾ in.
64 sq. ft. and over..... 1 in. x ¾ in.

When thermo traps are used, the bushings should be:

63 sq. ft. and under.....¾ in x ½ in.
64 to 175 sq. ft..... 1 in x ½ in.
176 sq. ft. and over..... 1 in. x ¾ in.

LEGAL DECISIONS

Abandonment of Service.

The New York Commission, Second District, Board v. Waterville Gas & Electric Co., that a utility supplying three distinct kinds of service, gas, electricity and steam heating, cannot be compelled to continue one of them (in this case the supply of gas) where it appears that in order to do so it will suffer losses that are not incidental but permanent, and liable to increase. A large part of the company's gas plant had been destroyed by fire; at the time of the fire there were about ninety consumers of gas for heat and light, and it was claimed that about sixty of these used gas for lighting purposes exclusively.

Conditional Sale of Heating Plant.

The Alabama Court of Appeals holds, Barbour Plumbing, Heating & Electric Co. vs. Ewing, 77 So. 430, that an oral contract between the seller and the buyer of a heating plant that the sale was conditional and that title should not vest in the buyer until after full payment, being made with reference to personal property, did not violate the statute of frauds. The status of the property as personal property, with right of removal in the seller, was preserved as against prior mortgages of the realty where it was installed, unless by subsequent conduct the parties manifested an intention to attach the property to the realty. Where there is actual annexation of property to realty, application to the use or purpose to which that part of the realty with which it is connected is appropriated and the parties intend to make thereby a permanent accession to the freehold, the chattel loses its character as personal property and becomes real estate. A conditional seller of a heating plant installed in a hospital which was subject to a mortgage, by filing a statutory lien on the hospital property, recognized the title as being in the mortgagor, and was thereby precluded from setting up title against the mortgagee, such election between inconsistent rights being irrevocable.

Increase of Rates Equal to Increased Cost of Coal.

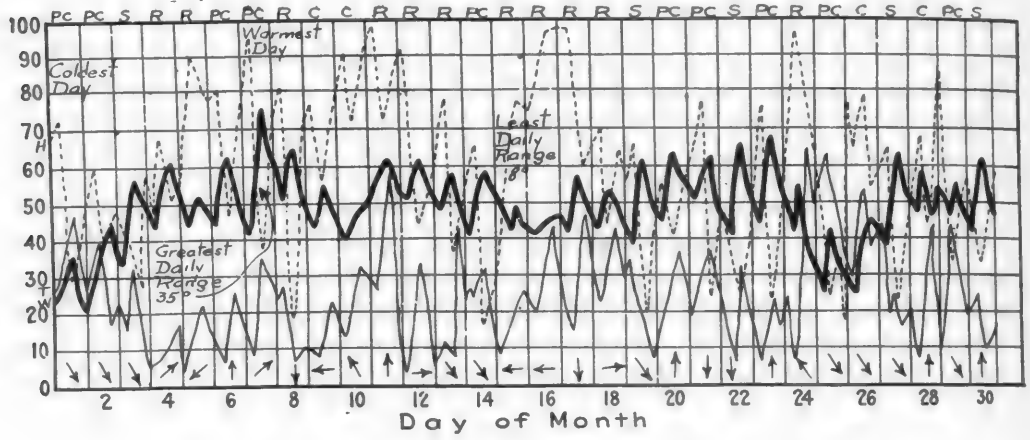
The Illinois Public Utilities Commission has authorized the Rockford Electric Company to increase its rates for steam heating to produce an increase in gross revenues equal to the increased cost of coal to the company.

The Wisconsin Railroad Commission holds that, in determining the reasonableness of proposed increases in heating rates necessitated by the increased cost of coal, no consideration should be given to the fact that landlords are not in a position to shift the burden of increased heating rates to their tenants through changes in leases, some of which have a long time to run. While it is true that landlords may not be in a position to pass the added burden at once, the commission considered they were in no different position in that respect than they would be were they supplying their own heat.—The Milwaukee Electric H. & Light Co.

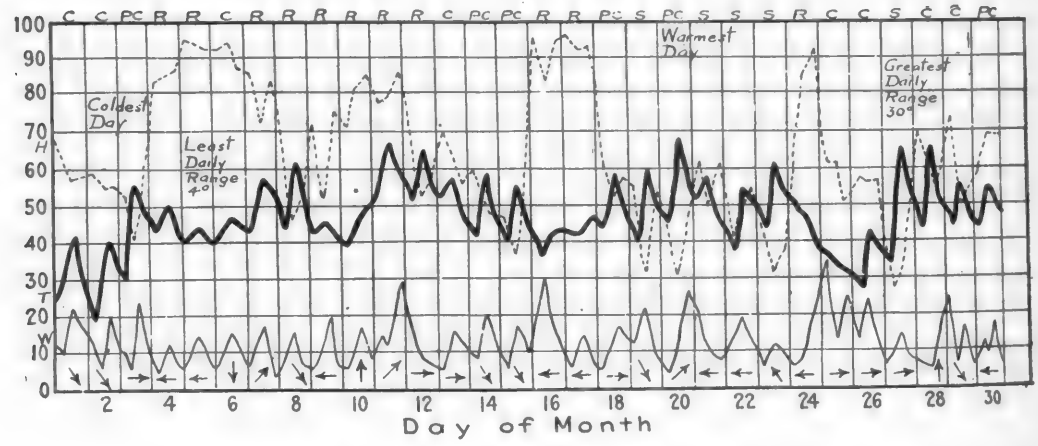
The Wisconsin Commission allowed a heating utility, the Wisconsin Power, Light & Heat Company, a temporary increase in rates where it was found that, on account of an increase in the price of coal, the increase in the cost of heating under present conditions, as compared with the year ended June 30, 1917, was between 5 and 7 cents per square foot of radiation.

THE WEATHER FOR APRIL, 1919

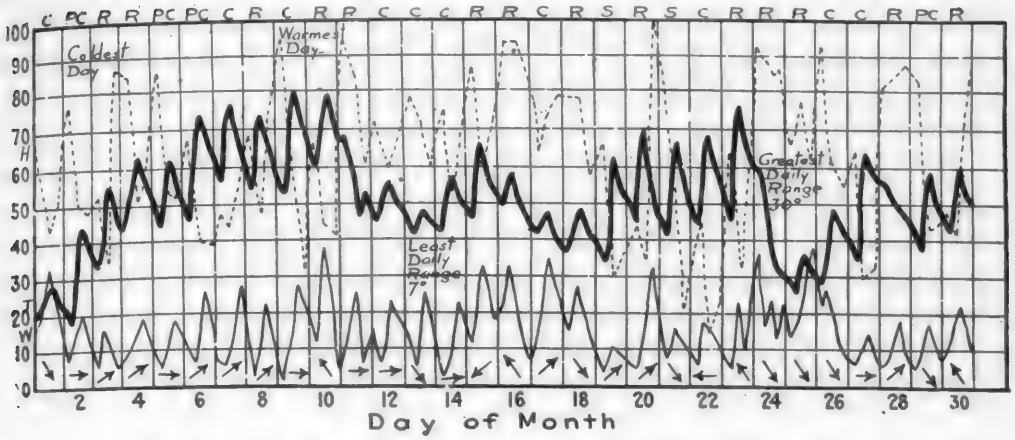
	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, degrees F	76	68	80	75	82
Date of highest temperature	7	20	9	6	22
Lowest temperature, degrees F	21	19	19	28	32
Date of lowest temperature	1	2	2	1	1
Greatest daily range, degrees F	35	30	30	30	31
Date of greatest daily range	7	27	23	23	14
Least daily range, degrees F	8	4	7	3	8
Date of least daily range	15	5	13	15	16
Mean temperature for month, degrees F	48.8	47	51	48	57.5
Normal mean temp. for month, degrees F	48.1	45.3	51	45.9	56.1
Total rainfall, inches	2.55	2.33	3.07	3.16	1.76
Total snowfall, inches	Trace	Trace	0.5	Trace	Trace
Normal precipitation, this month, inches	3.3	3.55	2.9	2.88	3.52
Total wind movement, miles	13720	7525	8445	9402	10833
Average hourly wind velocity	19.1	10.5	11.7	13.1	15
Prevailing direction of wind	N. W.	W.	S. W.	S.	S.
Number of clear days	5	6	2	3	10
Number of partly cloudy days	13	7	5	12	12
Number of cloudy days	12	17	23	15	8
Number of days on which rain fell	13	12	14	18	11
Number of days on which snow fell	Trace	Trace	2	2	—
Now on ground at end of month, inches	None	None	None	None	None



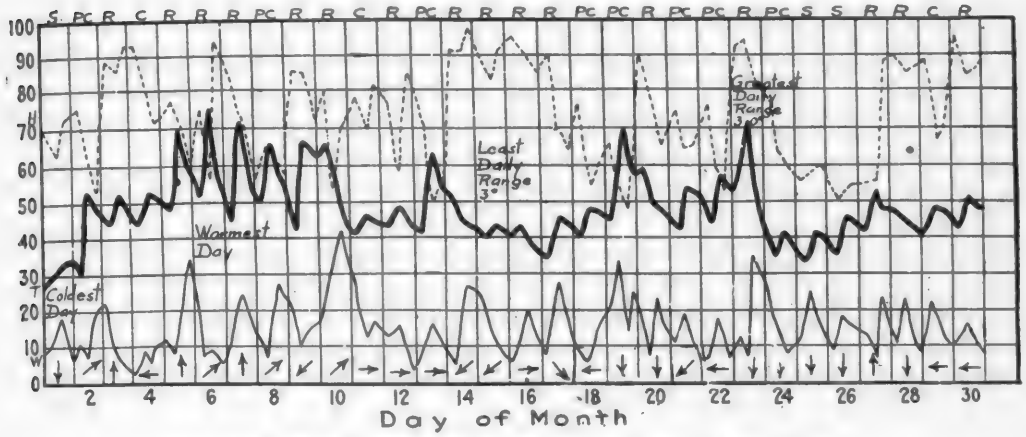
RECORD OF THE WEATHER IN NEW YORK FOR APRIL, 1919.
(Relative Humidity Curve Plotted from Hourly Readings).



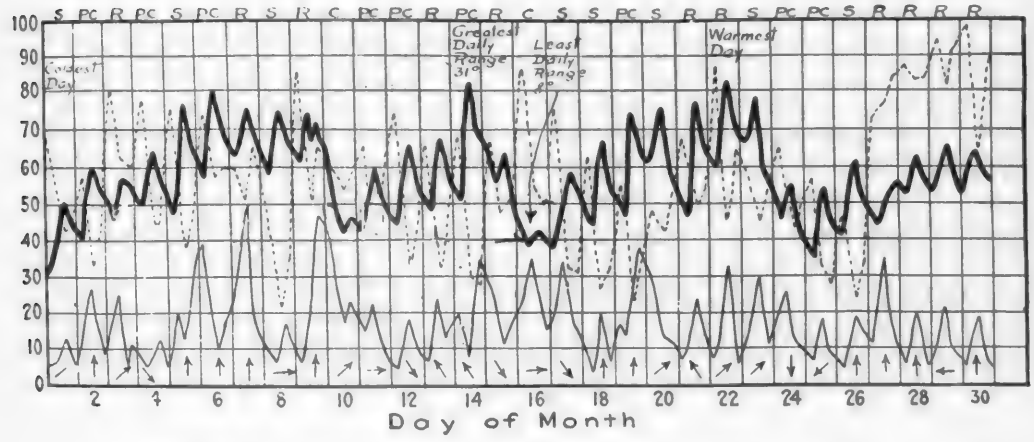
RECORD OF THE WEATHER IN BOSTON FOR APRIL, 1919.



RECORD OF THE WEATHER IN PITTSBURG FOR APRIL, 1919.



RECORD OF THE WEATHER IN CHICAGO FOR APRIL, 1919.



RECORD OF THE WEATHER IN ST. LOUIS FOR APRIL, 1919.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicates temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate relative humidity in per centage from readings taken at 8 A. M., 12 M., and 8 P. M.
S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wind.

CORRESPONDENCE

Indirect Heating Problem.

EDITOR HEATING AND VENTILATING MAGAZINE:

Will you answer through the columns of your valued paper the following question:

In a hot blast system of heating I have estimated the B. T. U. losses through the walls, floors, ceiling, windows, etc., and knowing the amount of air required I have also estimated the number of B. T. U. leaving the room through the vents. Adding these two, I have the total B. T. U. required and the number of cubic feet of air per minute. What shall the temperature of the air be when leaving the heating stack or leaving the register face? I have consulted numerous text-books, but they all assume that the air leaving the register shall be 125° or some other assumed temperature, which seems to me is nothing but guessing. I can estimate the size of my heating stack from tables in the American Radiator Company's "Engineering Data, Vento Heaters," if I only knew the "final temperature of air leaving heater," as noted on Pp. 24-37 of the manual mentioned.

Assuming a room has a cubical space of 1,540 cu. ft., the B. T. U. losses through walls, windows, etc., are 17,000 B. T. U. The room temperature shall be 100° and there shall be a three-minute air change. At what temperature shall the air enter the room? The heating stack and fan will be located just outside of the room, the room to be used for drying. C. R. J.

San Francisco, Cal.

Any air change, in computing heat losses, should be neglected. The cubic feet of air at 100° will be per hour:

$$\frac{1540 \text{ cu. ft.}}{3 \text{ min.}} \times 60 \text{ min.} = 30{,}800 \text{ cu. ft. per hour.}$$

We will assume the air entering the stack at 70°, and 80% humidity, with 6.5 grains of moisture per cubic foot and 7,000 grains to the pound. Then

$$\frac{30{,}800}{7{,}000} = 29 \text{ lbs. moisture.}$$

Dry air at 100° is approximately 0.07 lbs. per cubic foot. Then $30{,}800 \times 0.07 = 2{,}156$ lbs. dry air. (The specific heat of air is 0.24 and the specific heat of steam, 0.48.)

$2{,}156 \times 0.24 = 517.4$ B. T. U. per degree per hour.

$29 \times 0.48 = 13.9$ B. T. U. per degree per hour.

Total B. T. U. $= 531.3$ B. T. U. per degree per hour.

Then

$$\frac{17{,}000 \text{ B. T. U.}}{531.3} = 33° \text{ rise in temperature.}$$

The temperature of the entering air will be 133°, plus an assumed factor of saftey.

The air under these conditions has greater facilities for absorbing moisture and whatever heat is necessary to raise the temperature of the products dried should be added, modified by the period of time it remains in the dry room. Increasing the incoming temperature by this amount.

Suppose that the condition of the air, due to moisture in the product dried is such that 4 grains are added, making a total of 10.5 grains and the room is still maintained at 100°. The condition of the air will then be 100°, with 55% humidity and the incoming air temperature will be as follows:

$$\frac{30{,}800 \times 4 \times 0.48 \times 1{,}000}{7{,}000} = 8{,}448 \text{ B. T. U. per hour.}$$

$8{,}448 \div 531 = 16°$ F., or the incoming air temperature will be 149° F. Or, if the same heat is added, with the incoming air temperature at 133°, the room temperature will be reduced 84°, with 80% relative humidity.

By increasing or decreasing the amount of air per minute the incoming air temperature is changed accordingly for the same transfer of heat The effect of moisture and heat required to raise the temperature of material dried is an important item. Multiply the weight by the specific heat of the substance dried by difference in temperature of 100° and its temperature when placed in the room, and divide by the period of operation

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The Engine Horse-Power Formula in Standard Data Sheet No. 49-A.

EDITOR HEATING AND VENTILATING MAGAZINE:

In your Standard Heating and Ventilating Data Sheet No. 49-A, your engine horse-power formula is misleading. You have given the formula as correct for a single-acting engine. Steam engines are

most commonly double-acting and the formula ought to be given as

$$\frac{2 \text{ PLAN}}{33{,}000}$$

Unless you state that "N" represents the "number of strokes per minute" and not the R. P. M.

J. M. KENT.

Kansas City, Mo.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Bureau of Research to Start Operations This Summer.

It is announced that Professor John R. Allen, director of the Bureau of Research of the American Society of Heating and Ventilating Engineers will assume active charge of the bureau on August 1, 1919. Offices for the bureau will be provided in the main building of the U. S. Bureau of Mines in Pittsburgh, where, as already announced, the bureau will have its laboratory. The location of the building is of particular importance. Adjoining is the Carnegie Institute of Technology, and within a block is the Carnegie Library. The University of Pittsburgh stands on the next hill, within plain sight and short walking distance. The Mellon Institute of Research is only a few blocks away. From this it may be seen that the atmosphere of scientific investigation and research and the assistance and co-operation that will be at hand is of the greatest value to this undertaking.

According to the contract between the society and the Bureau of Mines the society agrees to expend not less than $15,000 per year in this co-operative plan (it expects to spend at least $25,000). The society will furnish a Director of Research at a salary of $6,000 a year; such assistants, investigators, engineers, stenographers, etc., as may be required, and the funds available will permit; and the necessary instruments, appliances and apparatus for carrying on the work under investigation.

The Bureau of Mines is to furnish three investigators; one at a salary of $3,000; one at $1,800 and one at $1,200. The Bureau of Mines will also furnish office space and janitor service; use of their physical and chemical research laboratories as space conditions may permit and the requirements may dictate; use of special laboratory in connection with the power house; service in the form of steam at high or low pressure; direct or alternating current; hot or cold water and gas, etc.; use of such instruments as they may have available.

Some idea of the scope of the work to be undertaken by the Bureau is given in the statements, published in the Society's Journal, of some of those who have been most active in the bureau's establishment.

Past President F. R. Still, for instance, states:

"One of the first things on which the work will be centered, will be an effort to determine what physical conditions of the atmosphere must be produced in order to maintain the same perfectly healthful effects as are obtained in pure, clean, fresh, outdoor air. This condition is not known today to physicists, thus opening an avenue to constant assaults by physicians and others. Such criticisms are quoted repeatedly, to the discredit of this branch of the engineering profession, and to the business of the manufacturer and the contractor.

"Next in order will be a scientific determination of heat losses by the use of various kinds of materials commonly employed in the construction of all kinds of buildings.

"Then will be investigated the efficiency of various kinds of radiation and the proper place to locate radiation to secure the best and most efficient results in different types of buildings.

"The most efficient methods of burning different kinds of coal in different types of boilers and furnaces, warm-air furnaces and furnace heating, pipe sizes for steam and water mains, and hundreds of other subjects, will be investigated.

"Many manufacturers have made a practice of conducting private investigations to develop their apparatus to the point of commercial perfection which is to them most desirable, finally submitting their products to the experimental laboratory of some prominent university so as to gain an endorsement having some semblance of impartiality. This never succeeds in convincing the public, as there is no comparison with other makes of the same apparatus, nor does this method establish any standard by which to measure the performance of the apparatus tested. Hence the time and expense thus employed is usually poorly invested if not entirely wasted.

"This project is of such importance to every manufacturer, contractor, jobber, and specialist in the heating and ventilating field that it should receive his unqualified approbation and financial support. It is a

big undertaking and will entail a heavy expense for several years. The financial support of every manufacturer and engineering organization must, therefore, be enlisted, and such financial support must be supplemented by the personal support of everyone concerned."

Past-President H. M. Hart writes:

"My ideas as to the work to be undertaken are:

1. To establish a standard method of measuring heat loss through various forms of building construction.
2. To establish constants for heat loss through various forms of building construction. What is meant by building construction is not building materials in themselves, but for instance, an entire window built up with wood sash, metal sash, wood sash with metal weather strips, etc., brick wall with lath and plaster applied on metal sash, frame construction with brick veneered finish, various forms of construction with stucco finish, etc.
3. To ascertain by experiment the average air change in dwellings and other types of buildings of various construction.
4. To establish the most efficient and practicable method of burning all kinds of fuel in house heating boilers.

"The above work will undoubtedly result in better methods in building construction because with definite information we could show the architect and owners in dollars and cents where the expenditure for making a building properly weather-proof would be justified by the saving in fuel involved."

Mr. Perry West, who was chairman of the Research Bureau Committee in 1917, says:

"Our functions should, of course, extend to the organization and co-ordination of manufacturers, medical men and the users of heating and ventilating apparatus in their respective proper relations to the production of proper results. Now, as to just what we should first undertake; I have a very decided opinion that this should embody those things which are of the most vital importance to the welfare of humanity. I would name these in the order of their importance as follows:

1. The determination of the best methods for defining and maintaining the best heating and ventilating conditions in homes, public buildings and factories.
2. Determination which would tend to place some of our most commonly used methods of heating and ventilating, such as the furnace system, on a more scientific basis.
3. A determination of more scientific methods for meeting some of our unusual heating and ventilation conditions, such as those connected with the modern tall office buildings, the modern large factory buildings and buildings requiring intermittent service, as compared with those requiring continuous service.
4. The determination of a more scientific basis for the standard factors connected with the art of heating and ventilating, such as the heat loss through various building materials, efficiency of various kinds of radiation under various conditions of use, the pipe size factors for different types of heating systems, determination factors for air ducts and standard methods of testing and comparing the performance of heating and ventilating systems with the proper results to be attained."

Booklet on Heating Engineers' Research Bureau.

A special booklet has been issued by the Committee on Research of the American Society of Heating and Ventilating Engineers giving the details of the development of the society's research bureau, some idea of the work it will undertake and a description, with illustrations, of the Bureau of Mines Building, in Pittsburgh, where the bureau will be located. The booklet concludes with a list of contributors to the support of the bureau, whose subscriptions were $25.00 and over.

Meeting of Research Bureau Committee.

An important meeting of the Research Bureau Committee of the heating engineer's society was held at headquarters May 19, which was attended by representatives of the Working Conditions Service of the Department of Labor, including Grant Hamilton, chief of the division; and several members of his staff, including Dr. A. J. Lanza, B. J. Newman and R. S. Bonsib. The desire of the Working Conditions Service to co-operate with the society led to numerous suggestions that are expected to have an important effect widening the activities of the heating and ventilating industry.

Appointment of Legislative Committee.

A legislative committee of the heating engineers' society has been appointed by

President Walter S. Timmis, to keep in touch with efforts to enact legislation affecting heating and ventilating engineering. The committee consists of J. F. G. Miller, chairman; and J. T. Bradley, Frank K. Chew, August Kehm, A. S. Kellogg, P. H. Seward, Warren Webster and H. W. Wendt. This committee is intended to serve as an executive committee to be supplemented by a general committee, with a representative from each State. It is expected in this way to keep track of any attempted legislation that would have and might have an effect on the industry.

New York Chapter Closes Successful Season with Annual Dinner.

With a guest table that would have done credit to an annual banquet of the heating engineers' society and with an attendance of over 80 members and guests, the New York Chapter closed its season in a blaze of glory with a dinner and installation of officers at the Building Trades Club, May 19. President P. H. Seward was the toastmaster and the guests included four of the principal representatives of the Working Conditions Service of the Department of Labor, including Grant Hamilton, director; Dr. A. J. Lanza, chief of the division of Industrial Hygiene and Medicine; B. J. Newman, chief of the research branch of the division, and R. S. Bonsib, chief of the division of safety engineering. Other guests present were Dr. E. Vernon Hill, head of the Division of Ventilation of the Chicago Department of Health, and vice-president of the heating engineers' society; Professor John R. Allen, director of the heating engineers' research bureau; President J. R. McColl of the Michigan Chapter of the society; A. S. Kellogg, president of the Massachusetts Chapter; and Lieutenant William G. LeCompte, of the 27th Division, who has recently returned to his duties with Jenkins Bros., of New York.

The chapter members present included Walter S. Timmis, president of the society, and Perry West, the newly-elected president of the New York Chapter.

Lieutenant LeCompte gave a vivid account of the charge of the 27th Division through the Hindenburg line and of the many unusual phases of army life in the front line trenches.

The main speaker of the evening, Grant Hamilton, was then introduced. Mr. Hamilton spoke at length of the plans of his division towards the improvement of working conditions, including the proper heating and ventilation of mills and factories. He declared that the rejection of nearly 33% of the drafted men, most of whom came from industrial life, was an appalling reflection on present-day conditions, while the percentage of accidents still being reported called for concerted effort on a large scale, and under government supervision, to reduce their number. He stated that the continuation of the division after July 1 was now before Congress, which brought out a suggestion later from Frank T. Chapman that the members of the chapter, and of the society generally, communicate immediately with their Congressmen and Senators to urge the continuation of the Working Condition Service.

The other guests were called upon and responded briefly, as the hour was late. Dr. Hill was introduced as an aerologist. He said he did not know just what was meant by the insinuation but declared that he had plenty to say on the subject, at that, and threatened to usurp the time at a future meeting to unbosom himself. Toastmaster Seward suggested to the incoming officers that they take advantage of the offer in making up next year's programme.

Perry West was introduced as the incoming president of the chapter and spoke of the new year as being full of promise. Vice-president W. L. Fleisher and Secretary E. A. Scott of the chapter also spoke.

Illinois Chapter.

The construction and operation of central station heating systems were taken up at the May meeting of the Illinois Chapter, the speaker of the evening being F B. Orr, mechanical engineer for the Illinois Maintenance Company, of Chicago. Mr. Orr predicted the rapid growth of central heating and described it as the ideal method of heating.

The committee appointed to make comparative tests of brick-set fire-box boilers and asbestos-covered firebox boilers was asked to proceed with the tests as soon as possible so that the results could be presented at the next meeting of the chapter which will be in the Fall, in October.

The chapter's April meeting was given over to a description of the air-conditioning plant installed by the Carrier Engineering Corporation in the Government ammonia nitrate plant at Perryville, Md. and to the work of the Illinois Fuel Administration. The principal speakers were H. B. Matzen, of the Carrier Engineering Corporation, and Joseph Harrington, formerly an engineer with the Illinois Fuel Administration.

A committee was appointed, consisting of J. M. Stannard, H. G. Thomas and E. V. Hill, to co-operate with the Western Society of Engineers in opposing the passage of ill-considered legislation. The appointment of this committee was with particular reference to the so-called "architects' and engineers' bills," which, if passed, would mean that engineers could work only for licensed architects. It was brought out that there was no chance of either of the bills being passed in its present form.

Another committee, consisting of J. D. Small, W. J. Mauer and G. A. Muir, was appointed to co-operate with Mr. Harrington in a series of tests he is making in his own home of the operation of the water heating system, including temperature and humidity experiments.

Massachusetts Chapter.

"Fuel Conservation in Massachusetts—Before and After the War," was discussed at the May meeting of the Massachusetts Chapter, the principal speaker being Professor Arthur E. Norton, of Harvard University. The meeting was held at the Boston City Club, May 5. Following Professor Norton's address, Charles F. Eveleth described the steam-heating plant at the Boston Army Base in South Boston, which was accompanied by the display of plans of the layout.

New chapter officers will be elected at the June meeting.

National Pipe and Supplies Association.

A brilliant business outlook in the not distant future, an increase in the cost of doing business resulting in a higher "overhead," and a prospect of higher prices rather than reduced prices, were some of the principal thoughts brought out at the tenth annual convention of the National Pipe and Supplies Association, held in Pittsburgh, Pa., May 12-13. The association voted to contribute $1,000 towards the Trade Extension movement.

The committee on fittings called attention in its report to the practice of making sales of fittings without profit in order to make sales of pipe and other supplies, also that makers were seeking sales direct to the jobbers' customers. The convention later passed a resolution against the sales methods of manufacturers in selling direct in territories where jobbing connections are already established. It was also voted to adopt a uniform price on these commodities.

The work of the Trade Extension Bureau was presented by C. V. Kellogg and by William J. Woolley, chairman of the bureau's publicity committee. The movement was commended by President Huesman and the sum of $1,000 was voted to help finance the bureau.

Several formal addresses were made, including one on "America's New Place in the World," by James Francis Burke, general counsel of the Pittsburgh Chamber of Commerce; one on "Compensation of Salesmen," by I. F. Young in which figures were presented showing how the employees benefited according to the company's profits, and an address by John Simmons on "Profit Sharing."

New officers were elected as follows:

President, George V. Denny, Savannah, Ga.

First vice—president, F. M. Sheldon, Boston, Mass.

Second vice-president, W. E. Clow, Sr., Chicago.

Secretary and treasurer, George D. McIlvaine, Pittsburgh, Pa.

Members of the Executive Committee: W. P. Mars, Duluth, Minn.; E. I. Leighton, Fort Dodge, Iowa; George B. Limbert, Chicago; C. A. White, Philadelphia; Charles H. Simmons, New York; G. H. Gorton, Kansas City, Mo.; George Puchta, Cincinnati, O., and Harry W. Haldeman, Los Angeles, Cal.

Advisory Board: A. E. Ford, Philadelphia; A. B. Pierce, St. Louis, Mo.; L. C. Huesmann, Indianapolis, Ind.

Ohio Association.

The following officers have been elected of the Ohio Association of Heating and Piping Contractors: President, John V. Vogelpohl, Cincinnati; vice-president, W. H. Conklin, Columbus; secretary, John K. Peck, Cincinnati.

Boston Association.

Frank A. Merrill, Merrill Co., was re-elected president of the Heating and Piping Contractors' Boston Association at its annual meeting. Other officers elected are: Vice-president, Herbert A. Snow; treasurer, Fuller C. Scofield; secretary, Charles W. Sisson. Directors: Frank S. Cleghorn, H. E. Whitten, I. D. McLean, Harry E. Barber, Elmer S. Hollis and Peter J. McMurrer.

The Progress of Unit Ventilation.

The faith shown in the merits of the unit system of ventilation for schoolrooms, auditoriums, theatres, churches and residences is exemplified in a remarkable catalogue devoted to the Univent, a device which has recently been placed on the market by Moline Heat, Moline, Ill..

The Univent is described as the individual ventilator. It is briefly a cabinet containing a radiator and fan in which fresh air is drawn into the upper compartment through a window or inlet in the wall. This compartment is provided with an electric motor which operates two centrifugal blowers. These in turn create the blast which forces the air down through the tempering side of the radiator, over the dust-eliminating device in the bottom of the compartment, then up through the heating side of the radiator and out through the front of the machine toward the ceiling. The heated air leaves the machine at a velocity of more than 1,000 ft. per minute, and as it strikes the ceiling it is deflected and diffused throughout the room. The diffusion, it is stated, is so perfect that the temperature at the floor and ceiling will always be found identical wherever the Univent operates.

The exhaust air leaves the room through a vent flue or register and passes to the outside of the building either direct or through a corridor or attic.

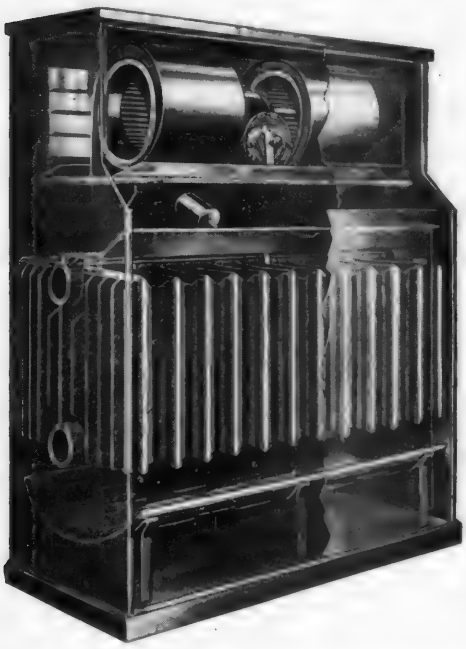


FIG. 1.—CONSTRUCTION OF UNIVENT.

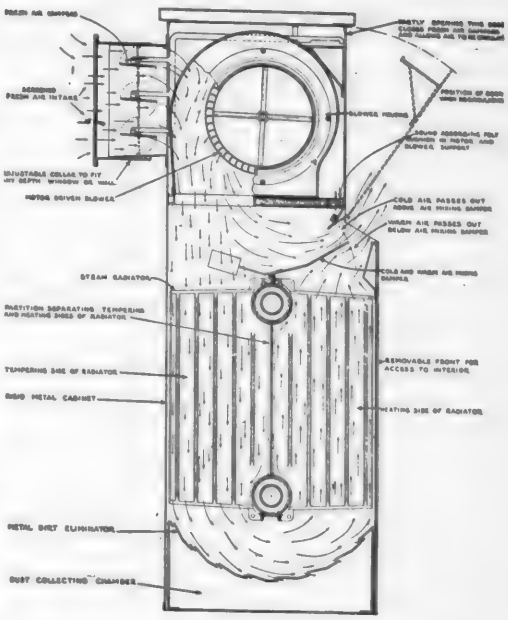


FIG. 2.—HOW THE UNIVENT OPERATES.

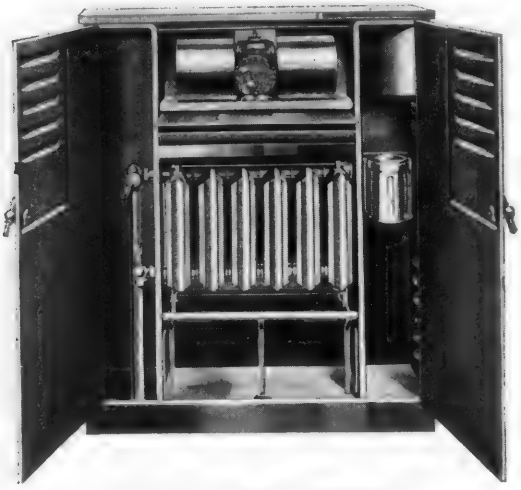
The cabinet is built of steel and is made in two styles. To insure noiseless operation and to give variable speed to the fan, direct-current motors are used as a standard. Where only alternating current is available, a small motor generator can be installed to convert the current from alternating to direct. With the smaller machines, however, motors are furnished that can be used with either direct or alternating current.

Both the blowers and the radiator used are special. The vanes and rims of the blowers are struck from a single sheet of non-corrosive metal and cut and formed by a die so that there are no bolts or rivets in the blower. The radiator used is of ingenious design. The center extended surfaces themselves form a division wall, thereby really providing two radiators, one to temper the air as it flows downward through the Univent into the lower mixing chamber, and the other section to reheat it, before it is delivered to the room. This construction provides a long travel of air over the radiating surface, and also makes it possible to use a mixing damper above the radiator for absolute temperature control.

Provisions are made for recirculating the air by opening the door or cover which forms the front of the upper compartment. Where compressed air systems are not available an "Autotherm," which is an independent, self-contained temperature controller, may be used.

The lower compartment of the cabinet is regularly fitted with an unique device for arresting and diverting such dirt or sand particles as are carried along in the air currents over its surface. The Univent can also be equipped with a water reservoir in place of the elminator.

Where it is desired to moisten the air, an automatic air moistener is furnished, being constructed of a number of aluminum vanes surrounding a copper cylindrical screen which revolves on two ball bearings and is supported just above the water reservoir. As the air flows through the lower chamber of the Univent, it causes the air moistener to rotate so that the small tips attached to the vanes dip into the water and distribute it over the screen



DE LUXE TYPE UNIVENT.

and surface of the vanes, whence it is absorbed into the air. Especial attention is called to the automatic operation of the air moistener, as well as to the means for raising or lowering the amount of moisture furnished.

The catalogue itself is one of the most attractive that has appeared in the trade in some time and reflects great credit on its compilers, as well as being a notable example of the printer's art.

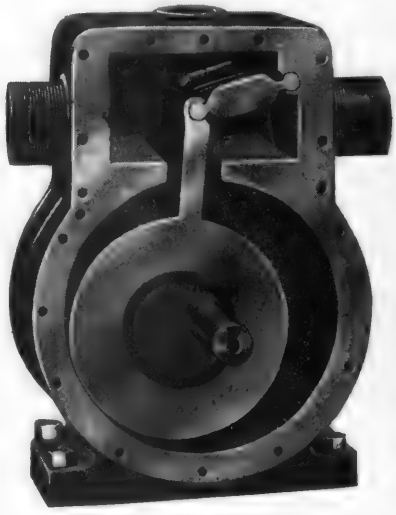
A separate publication is entitled "How to Plan and Specify the Univent," giving elaborate capacity tables for the five series of the Univent, embracing a total of 135 sizes. Roughing dimensions are also included for each series, these being supplemented by numerous detail plates accurately showing different arrangements of the Univent and of the Moline exhauster. Typical specifications are presented in full for the use of the Univent system.

The Thompson Rotary Air Pump.

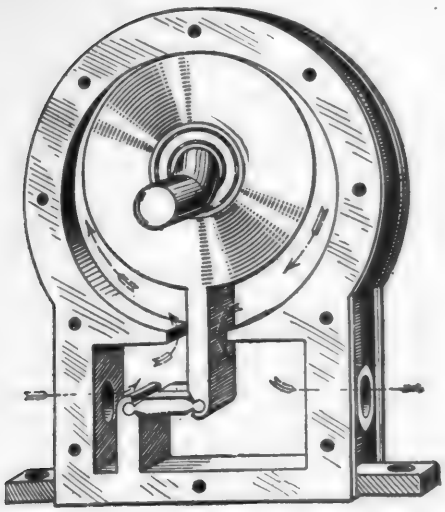
A pump that is described as the only notable advance made in air pumping equipment during the past ten years, has been brought out by the Thompson Mfg. Co., Des Moines, Ia., under the name of the Thompson rotary air pump, for use especially with vacuum heating systems. Emphasis is laid on its low cost of operation and maintenance, as well as its quiet operation. It is notable for having no gears, no sliding wings, and no valves.

In this pump there are but three moving members, the crank, the impeller and a hinged plate. The hinged plate separates the suction and the discharge side of the pump cylinder. The crank is mounted on Graphalloy bearings which are described as "oilless." An outboard bearing supports the pump pulley and is keyed to the shaft. Accurate machining of the surfaces of the impeller and pump casing is made possible through their cylindrical shape. The impeller, however, is at no time in contact with the casing but is adjusted to maintain the closest clearance. The crank shaft, on which is mounted the impeller, is fitted with ball bearings, being supported by end-plate bearings. In operation the crank turns in a clockwise direction, operating the impeller so as to force the air in the course indicated by the arrows. Although without a water or oil seal, this pump, it is stated, is capable of maintaining a pressure of 6 lbs. or a vacuum of 16 in.

Fig. 2 shows a typical vacuum unit consisting of a Thompson rotary vacuum pump, with outboard bearing and air chamber, motor belted to pump, suction



THOMPSON RETURN LINE PUMP.



OPERATION OF THOMPSON VACUUM AIR LINE PUMP.

strainer with air chamber, discharge chamber with air eliminator, check valve and cast-iron base. The pump, strainer, or discharge chamber can be removed from the base without disturbing the piping.

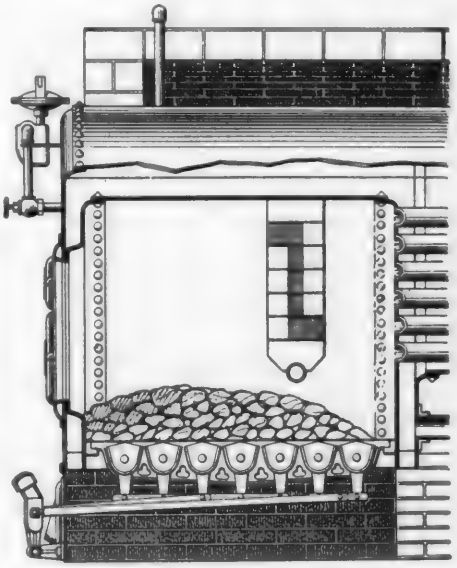
Both the return line and the air line types are each made in four sizes with capacities ranging, respectively, from 5,000 to 35,000 and from 3,000 to 44,000 sq. ft. of radiation.

Trade Literature.

MOLINE HEAT EVERYWHERE, devoted to the application of the Moline Heat system to large buildings, groups of buildings and factories, is the subject of a well-prepared catalogue (Supplement A). In addition to the descriptive matter, which is accompanied by numerous illustrations showing broken views of the Moline devices, the catalogue is notable for the typical layouts presented of various arrangements of the Moline system. One layout, for instance, shows a live steam system, equipped with pump and receiver. Another shows a live steam system, with hot well and electric motor-driven centrifugal pump. A third layout illustrates an exhaust steam heating system equipped to discharge the condensation to a higher level. A fourth layout shows a high or medium-pressure live steam system, with the condensation returning by gravity to the receiver and thence trapped into the boiler. Other typical layouts illustrate, respectively, an exhaust steam system in which the condensation flows by gravity to a feed-water heater, a standard arrangement for dry-kiln coils and, finally, a typical illustration of a system for use in connection with district heating service. A detail view is also included, showing blast-coil piping connections to a Moline seal. Size 8½ x 11½ in. Pp. 32.

FARNSWORTH CONDENSATION PUMPS, manufactured by the Farnsworth Co., Conshohocken, Pa., are the subject of a useful folder in which is given just the information, including detailed dimensions, needed by the busy engineer. Each type is illustrated photographically and by line drawings, making it easy to pick out the type required for given conditions. The folder contains an unusual amount of data in a form that is admirably concise and to the point.

THE SAVING OF FUEL by use of the Eureka Smokeless Furnace is described in a convincing manner in a new catalague issued by the Eureka Smokeless Furnace Co., Chicago, Ill., whose product is adapted for brick-set and portable firebox boilers and horizontal tubular boilers for low-pressure steam and water heating. The feature of this furnace is its arrangement for consuming the volatile or smoke-forming part of soft coal by first mixing it with the required amount of air and passing this mixture of gas and air through the hollow passages in the arch where it is raised to the ignition temperature. This mixture is discharged into the combustion zone behind the arch where the temperature is high, permitting complete non-smoking combustion to take place at that point. The arch is built of fire-brick, burned at a high temperature to produce a hard brick capable of resisting the effects of heat



HOW FIRE SHOULD BE STARTED IN A EUREKA SMOKELESS FURNACE.

and the abrasive actions to which it is subjected in the furnace. The catalogue is profusely illustrated with dimension drawings and tables. A special series of six drawings shows the furnace under actual working conditions indicating what to do at various stages in the combustion process. Size 6 x 9 in. Pp. 24.

TYCOS INSTRUMENTS for indicating, recording and controlling temperatures, are presented in a new general industrial catalogue, published by the Taylor Instrument Companies, Rochester, N. Y. This volume contains no less than 422 pages of useful and interesting temperature information. Many special applications are illustrated, showing the manner in which Tycos instruments can be adapted to diverse temperature needs. Practically every instrument made by the company is illustrated and much explanatory matter is added descriptive of their construction and principles of operation. The list includes thermometers of every description, index and recording thermometers, hydrometers, pyrometers, temperature and pressure regulators, barometers, and absolute pressure and draft gauges.

KEELER CROSS-DRUM WATER-TUBE BOILERS, made by the E. Keeler Co., Williamsport, Pa., are brought to the attention of the trade through the publication of a new catalogue. The boiler is offered to discriminating steam users as the product of 55 years' experience in constructing boilers of all standard types. This boiler is described as combining every good feautre that can be claimed for any type of water-tube boiler. The boiler consists of a front and a rear water-leg or header, a bank of generating tubes expanded into the headers in straight horizontal or staggered vertical rows, with an inclination of 1½ in. or more to the foot, and one steam drum. The steam is taken from the drum at a point where there is the least agitation of the contained water to insure dry steam. Vertical baffle walls direct the gases three times through the tubes, which are staggered, while the gases travel at right angle to them. The location of the baffles and area of the gas passages are determined by the grade of fuel to be used and the special conditions of service. Separate sections of the catalogue are devoted to details of construction, such as the header, the interior of the drum and manhole plate and yoke. Another section takes up the details of equipment. There are also views of typical installations. Tables of dimensions are included, covering 25 sizes of the standard type and 13 sizes of the junior type. The concluding pages are devoted to the standard type of Keeler water-tube boilers and the Keeler return tubular boiler. Size 7½ x 10½ in. Pp. 22.

KELLY & JONES COMPANY'S CATALOGUE R, for 1919, has been issued by the Kelly & Jones Co., Grennsburg, Pa., covering the company's full line of brass, iron and steel goods and specialties for steam, gas, water, air and oil. Size 5 x 8 in. Pp. 536.

SHUR-TITE BOILER, PIPE AND RADIATOR CEMENT, described as a composition of dry chemicals which, on being placed in a steam, water or vapor heating system, will find and permanently repair all leaks, has been brought out by the Shur-Tite Mfg. Co., of Cleveland, O., and is described in the company's circular matter. Among the advantages mentioned for Shur-Tite is that it does not lose its efficiency with age, and does not harden or evaporate if left in open can. In addition to its use for repairing broken boilers, often eliminating the necessity of replacing cracked sections, Shur-Tite is especially recommended by the manufacturers as a money and time saver in stopping small leaks in new installations at such points as boiler push nipples, radiators and in the boiler castings. Each can, which is listed at $6.00, contains sufficient Shur-Tite for a system of 1000 sq. ft. of direct radiation.

China Waking Up to the Use of Modern Heating and Ventilating Apparatus.

First-hand views as to the opportunities of the immediate future in China are given in a letter received from H. L. Alt, who recently was appointed China representative for Andersen, Meyer & Co., engineers, of New York. Mr. Alt sailed for Shanghai early in December. He writes:

"We are going to get into the heating game out here and if you have any friends among the manufacturers, I would be glad to receive their catalogues. We are especially interested in radiators, air washers, boilers and vapor apparatus.

As far as the heating situation out here is concerned, at present there isn't any situation. That is probably because there is not any heating, to speak of in Shanghai. There are no furnaces. One residence in Shanghai has hot water heat. Several business blocks have hot water. I have yet to find a steam heating system. The winters are somewhat milder than in New York, but the thermometer goes as low as 11° F. and the cold is the coldest kind of a damp cold, the kind that makes your teeth chatter and your bones knock together even when your heavy overcoat is buttoned tight.

"In spite of coal being at $28.00 per ton (Mex.) and never less than $15.00, practic-

ally all the heating, if you can call it that, is done with fireplaces, where only about 25% efficiency is developed.

"There is not a boiler or radiator or pipe manufactured in China, and the American manufacturer has this field open to his endeavors.

"I designed one job of hot water heating within two weeks after I landed and have a vapor steam job on hand now. Have also laid out a one-pipe system job for Pekin and am estimating on several others, some of which will be hot blast or forced hot water, for industrial mills.

"I believe there is a great field over here for air washers, as the summers are hot and long. Anything that cools is a God-send. Some of the architects out here actually didn't know that an air washer could do any cooling! The funny thing is that the Chinese people have gone without heating for so long that they have in a degree become hardened to the cold and are uncomfortable when a proper temperature is produced inside a building. They wear padded coats and padded vests, resembling bed comforters in construction, and these they wear all the time during the cold weather. The result is similar to wearing one's overcoat in the house. Thus, 50° to 60° is very comfortable for them and I recently read an architect's specification for a Chinese hotel in which he only asked for a 30° rise which, with 10° outside, will only give 40° inside temperature.

"You wait until we show them one honest-to-goodness heating job such as we put in the old U. S. A. and some of these English will sit up and take notice, even if it is not done the way we do it at 'ome."

St. Albans Plumbing & Heating Co., St. Albans, Vt., has been organized by Charles H. Anderson, formerly head of the disbursement department of the Central Vermont Railroad, and George H. Hersey, of St. Albans.

Meyer, Strong and Jones, Inc., 101 Park Avenue, New York, has succeeded to the engineering practice of Henry C. Meyer, Jr. and Bassett Jones, Associated, and of William E. S. Strong. Mr. Strong was connected, for many years with the American Radiator Company as chief engineer and is now that company's consulting engineer. During the war period he was connected with the export department of J. P. Morgan & Co. in the purchase of munitions. Mr. Meyer and Mr. Jones have been engaged in consulting work in New York since 1903 and have been responsible for the mechanical, electrical and power equipments of such buildings as those comprising the West Point Military Academy, and the Equitable, Bankers Trust, Guaranty Trust and Morgan Buildings. During the war they acted as consulting engineers for the steam and electrical equipment for the Naval Operating Base at Hampton Roads and other Government plants. C. A. King, H. E. Meeker, H. F. Richardson and J. J. Ruckes, who have been associated with Messrs. Meyer and Jones for a number of years, will be in responsible charge of the work in the new organization. The new firm will act as consulting engineers for steam and electrical work, power plants, etc.

KELLY CONTROLLERS for high and low-pressure boilers, which are being marketed by the Kelly Controller Co., Chicago, Ill., are gone into in detail in a new folder issued by this company. The low-pressure controller is described as a combined steam header, safety device, automatic water-feeder and an emergency temperature reducer, when the high-pressure controller combines a safety device, non-return valve, positive stop valve, alarm and steam separator. Each feature of both types is dealt with individually in the circular. The low-pressure controllers are made in twelve sizes, for boiler capacities ranging from 1,000 to 5,000 sq. ft. of radiation; the high-pressure controllers are made in two sizes.

The American District Steam Co. of North Tonawanda, N. Y., has just issued a special 80-page catalog descriptive of their Central Station and interior heating equipment. Also an interesting folder entitled "The Radiator Has the Floor" describing the Adsco Vapor Heating System. They will glandly send same to any one interested.

Receiver's Sale.

Logansport Heat & Power Company's Combination Heating and Electric Generating Plant, Buildings with Real Estate, Heating Mains, Transmission lines and Franchises therefor. Modern Plant of 2,000 H. P. Water Tube Boilers, Automatic Stokers, Coal and Ash Handling Machinery. 1,500 K. W. Electric Turbine and Engine Generating Equipment complete. A good field and going concern. Sale on July 8, 1919. Address, George S. Kistler, Receiver, Logansport, Ind.

SIZES OF RETURN MAINS.

The following table is based on a drop of 1 oz. in pressure in 100 feet of straight pipe. The percentage of steam is governed by the percentage of return pipe surface compared to the surface supplied by the supply main. Thus, if the total surface of the return line is 10% of the combined surface of the supply line, radiators and return line, then 10% of the steam carried by the supply main will pass through the radiators and out into the return main where it will be condensed Under this condition the return main will have to carry the return condensation *and* 10% of the steam as well. The size of the wet return is obtained by taking the steam rating and comparing the square roots of the densities of the steam at atmosphere and the water, the result showing that the density of the water is about 1600 times as great and $\sqrt{1600} = 40$ the comparative capacity of the wet return. Thus, a 2-in steam main carrying 300 sq. ft. of radiation at 1 oz. drop per 100 ft. of straight pipe will carry as a wet return, *with the same drop*,, $300 \times 40 = 12000$ sq. ft. The steam capacity is, therefore, 2½% of the wet return capacity and if the return must carry, in addition to the condensation, say, 2½% additional steam, its capacity would only be one-half as much. or $300 \div 5\% = 6000$ sq. ft., etc.

There is much room for argument as to the correctness of the above assumption and there is certainly much more vapor in a vacuum return than allowed for in this table, this increase being due to re-evaporization of the return under the lower pressure. Some engineers figure the vacuum return at 15% steam, a gravity dry return at 10% steam and a gravity wet return as given in the table, plus two pipe sizes for corrosion and sediment.

TABLE I.

Size of Steam and Return Pipes.

(1 oz. Drop per 100 ft. Straight Pipe.)

Size In.	S Diam.	A Steam Rating	B Wet Return	C 2½% Steam	D 5% Steam	E 7½% Steam	F 10% Steam	G 15% Steam	H 20% Steam
½		5	200	100	67	50	40	27	22
¾		20	800	400	270	200	160	114	88
1		40	1600	800	540	400	320	228	176
1¼		75	3000	1500	1012	750	600	427	330
1½		150	6000	3000	2024	1500	1200	855	660
2		300	12000	6000	4050	3000	2400	1710	1320
2½		500	20000	10000	6750	5000	4000	2850	2200
3		900	36000	18000	12150	9000	7200	5130	3960
3½		1500	60000	30000	20250	15000	12000	8550	6600
4		2000	80000	40000	27000	20000	16000	11400	8800
4½		2800	.....	56000	37800	28000	22400	15060	12320
5		3600	.....	.....	48600	36000	28800	20520	15840
6		6000	.....	.....	.....	60000	48000	34200	26400
7		9000	.....	.....	.....	.....	72000	51300	39600
8		13000	.....	.....	.....	.....	.....	74000	57200
9		18000	.....	.....	.....	.....	.....	.....	79200
10		23000	.....	.....	.....	.....	.....	.....	.....
12		37000	.....	.....	.....	.....	.....	.....	.....
14		55000	.....	.....	.....	.....	.....	.....	.....
16		78000	.....	.....	.....	.....	.....	.....	.....

Column "A," steam rating in equivalent square feet of direct radiation for piping within buildings for all classes of systems.

Column "B," rating for wet return main of a gravity system.

Column "C," rating for main return of the vacuum system.

Column "D," rating for the main return when it is above the water line in a wet-return gravity system.

Column "E," rating for the branch returns of the vacuum system, and for the branch returns that are above the water line in a wet-return gravity system.

Column "F," rating for the branch returns of a dry-return gravity system.

Columns "G" and "H," rating for gravity systems where the returns have unusual condensing capacity and for the returns in vacuum systems where jet water is used.

Column "S" is the nominal size of pipe diameter.

(J. A. Donnelly.)

RETURN PIPE SIZES.

In gravity systems the return pipe sizes will prove satisfactory if arranged as per the following table:

Size of Steam Main. In Diam.	Corresponding Return Main. In. Diam.
1½	1¼
2	1½
2½	1½
3	2
3½	2½
4	2½
5	3
6	3½
8	4
10	4½
12	5

(Harrison Safety Boiler Works)

ONE-PIPE STEAM SYSTEMS.

Radiator Runouts and Main Line Vents.

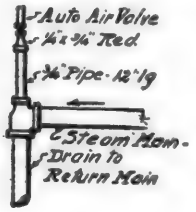


Fig. 1

Fig. 2

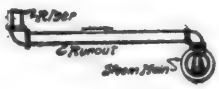


Fig. 3

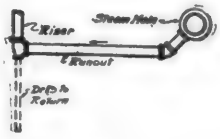


Fig. 4

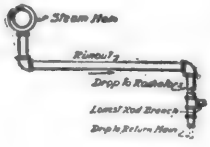


Fig. 5

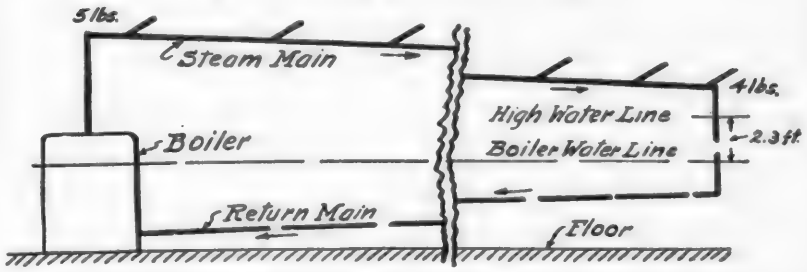
For the "circuit" system (See Fig. 1, Sheet No. 129-A) where the steam main drops down under the water line, an automatic air valve should be placed to relieve the air caught between the advancing steam and the water seal, when starting up the system. Otherwise, the air so pocketed will interfere with the return of the condensation and cause all sorts of hammering and trouble. Best results are obtained when the air valve is installed as shown in the detail, Fig. 1. In the "relief" and "Mills" systems (Sheets Nos. 129-B and 129-C), no such air valves are necessary, but are sometimes used at the end of the large steam main, merely as an aid to help relieve the air more quickly when starting up.

The steam runouts from the steam mains to the risers or radiators in a "circuit" system should be inclined down from the radiator or riser to the main and should enter the main at 45°, as shown in the detail drawing, Fig. 2, thus allowing the return condensation to flow along the bottom of the runout and down into the steam main without cutting across the path of the steam flow in the main. If the connection is made as shown in Fig. 3, the pouring into the steam main of the returning condensation is likely to interfere with the flow of steam therein.

The runouts for a "relief" system should be inclined in the opposite direction toward the drip connection at the base of the riser, as shown in the detail Fig. 4. It is practical to have these leave the main vertically downward, but the 45° connection is more popular. The runout from a steam main in the Mills system is generally arranged as shown in detail Fig. 5, and slopes toward the steam drops.

ONE-PIPE STEAM SYSTEMS.

Drop in Pressure and Rise of Return.



The accompanying drawing illustrates a diagrammatic elevation of a one-pipe system, assuming a 1-lb. drop in the steam line between the boiler and tne end of the line at times of maximum load. Thus, with 5 lbs. at the boiler and 1 lb. loss in the line the steam pressure at the far end of the line would be 4 lbs. The water in the wet return then has a pressure of 5 lbs. per square inch pressing down on its surface in the boiler and a pressure of only 4 lbs. per square inch pressing down on its surface in the vertical leg connecting with the steam main at the end of the run. This unbalanced pressure must equalize itself and does so by the water rising in the vertical leg until the vertical column of water in the leg counterbalances by its weight the difference between the two pressures; i. e., the pressure loss in the steam pipe.

This loss is here assumed arbitrarily as 1 lb. and since the weight of a vertical volumn of water is 0.43 lbs. per square inch for every foot of height, the rise of the water, under the assumed conditions, will be 1 lb. ÷ 0.43, or 2.33 ft. As a general thing, it is customary to allow less pressure drop and to keep 18 or 24 in. between the normal water-line and the high water-line established when the system is in operation. In other words, the lowest point of the steam and the radiation is kept at least 24 to 30 in. above the water-line of the boiler. In the circuit, relief and Mills system shown in Data Sheets Nos. 129-A, 129-B and 129-C, the normal water-line (N. W. L.) and the high water-line (H. W. L.) is indicated at the point on the return connections farthest from the boiler.

The high water-line should always be calculated to keep at least 6 in. below the steam main or lowest level of radiation, so that, with 30 in. difference, the water rise could not be over 24 in., with 24 in. difference the rise could not be over 18 in., etc. If 1 lb. = 2.3-ft. rise, then 16 oz. = 2.3 x 12, or 28 in. and 1 oz. = 1.8-in. rise. This results in a table for allowable rise as follows:

Allowable Rise of Water in Return Mains, Inches.	Allowable Loss in Pressure in Steam Mains, Pounds.
3.5	⅛
7	¼
14	½
28	1
42	1½
56	2
70	2½
84	3

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TRADE AND MISCELLANEOUS NOTES

Miscellaneous Notes.

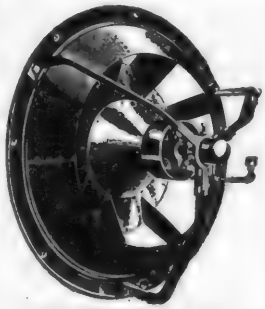
Watertown, N. Y.—A theatre ordinance which was submitted to the city council of Watertown several weeks ago by a committee, has been referred back to the committee by Mayor Breen with suggestions that a ventilation clause be added. The suggested amendment requires the installation of a ventilating system in all theatres, capable of delivering 20 cu. ft. of fresh air per minute per spectator. The ventilation must be arranged so that no one is seated in a draft.

American Society of Mechanical Engineers will have a special session on fuels, with papers on powdered fuel and oil fuel at its spring meeting in Detroit, June 16-19. Headquarters will be at the Hotel Statler. Other sessions will be devoted to industrial research and industrial peace. These two sessions will both come on the second day of the meeting, June 17.

Calvert Townley of New York was elected president of the American Institute of Electrical Engineers at the recent annual business meeting of the institute.

Among those attending the National Foreign Trade Convention in Chicago recently were W. P. F. Ayer, vice-president of the Walworth Mfg. Co., Boston; C. A. Dunham, president C. A. Dunham Co., Chicago, Ill.; Alfred B. Edes, Ohio Brass Co., Mansfield, O.; Alfred F. Howe, vice-president and general sales manager, Borden Co., Warren, O.; J. S. Peden, general sales manager Kennedy Valve Mfg. Co., Elmira, N. Y.; R. J. Stayman, manager Jones & Laughlin Steel Co., Pittsburgh, Pa.; Rawson Vaile, sales manager, American Blower Co., Detroit, Mich.; and Edgar F. Wendt, assistant treasurer of the Buffalo Forge Co., Buffalo, N. Y.

Building Permits for April, 1919, as compiled by the *American Contractor* for 149



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cities, show a gain of 93% over those for the corresponding period last year, the totals being $79,077,971, as compared with $41,028,999. This is the largest gain for any month this year. The increase was generally distributed. One of the largest gains was reported by Akron, from $511,956 to $2,590,775, an increase of 406%. Baltimore had a gain of 377%, Chicago 169%, Detroit 286%, Los Angeles 112%, Milwaukee 146%, Mineapolis 132%, New York (Bronx 659% from $302,771 to $2,299,498, Manhattan 496% from $558,700 to $3,333,750, Brooklyn 33% from $3,534,970 to $4,723,100; Richmond 75% from $211,634 to $379,580, Queens 342% from $743,510 to $3,290,226). The only large cities reporting losses were Buffalo 68%, Des Moines 38% Elizabeth 6%, Hoboken 80%, Holyoke 34%, Louisville 16% and Lawrence, Mass., 71%.

Major James W. H. Myrick of Boston, commander of the Boston Fusilier Veteran Corps, and a well-known heating and ventilating engineer of that city, has been reappointed captain of the State rifle team by Governor Coolidge. In connection with

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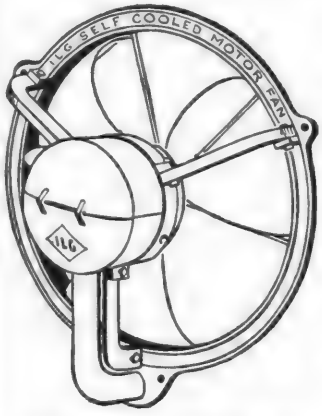
Warm weather brings with it many indoor air conditions which impede workmanship and reduce profits



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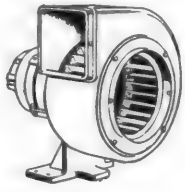
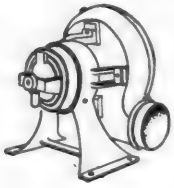
Note Section View



Type "V" Volume Blower



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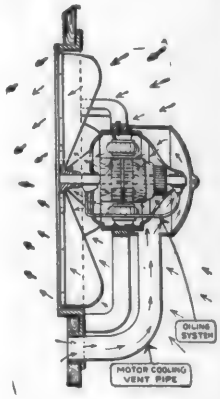
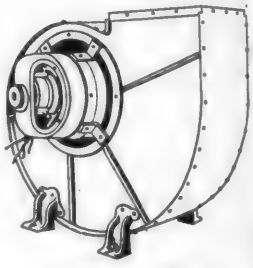


Section View



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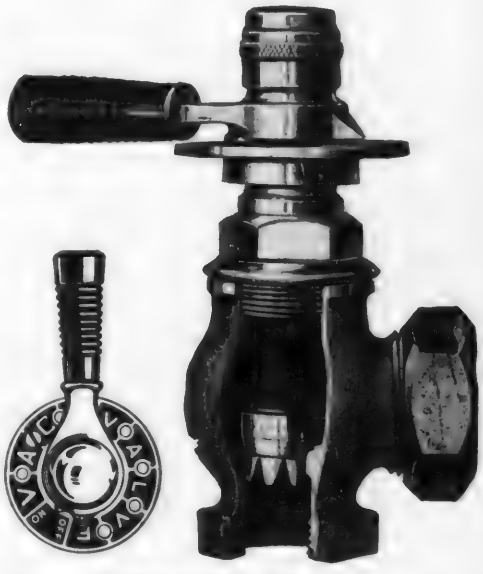

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a celebration of the corps' 132nd anniversary, Major Myrick led a parade through the streets of Boston, halting at the State House to place on the steps of the State House a memorial wreath dedicated to Governor Curtis Guild. The parade was reviewed by Governor Coolidge and by Mayor Peters. In the evening Major Myrick presided at a banquet in honor of the corps at which the guests included Governor Coolidge, Adjutant Jesse F. Stevens and other dignitaries.

Dallas, Texas.—An appropriation of $40,000 has been secured for a central heating and lighting plant for John Tarleton Agricultural College. The contract will be let at an early date, as the plans for the power house are already complete.

St. Joseph, Mo.—H. C. Westover, chief school engineer for the St. Joseph School Board, who has been inspecting heating practice in the East has submitted a report favoring the unit system of heating for school buildings. Immediately following his report, he was directed by the Board of Education to draw up plans and specifications for the installations of such a plant in the Jackson School building. According to Mr. Westover's report, the unit system is used extensively in schools throughout the East, and has proven successful in public school buildings in Chicago, New York and cities in New Jersey. The unit system referred to by Mr. Westover is the one in which a special enclosed radiator is used, each enclosure being fitted with a small fan that continually draws in air from outdoors through an opening in the window and forces it across the radiator and thence into the room. It is pointed out that by this method each room can be heated separately.

Springfield, Ill.—The creation of a State Ventilating Commission of three members, to act without salary, to regulate ventilation of all buildings in the State, is proposed in a bill introduced in the Illinois Senate by Senator Martin R. Carlson, of Moline. The preface of the bill says:

"A bill for an act to improve public health and safeguard it against the spread of tuberculosis, influenza and similar disease, so far as this can be accomplished by ventilation and to provide for continued research to develop correct principles of ventilation for the improvement of public health."

The bill fixes the minimum floor area per

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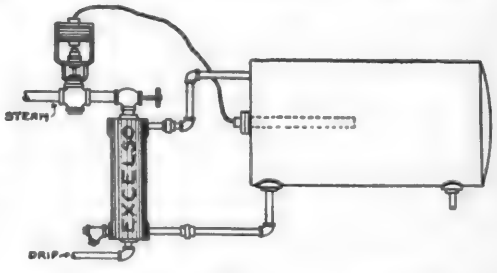

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occupant as well as the minimum cubic feet of air space per occupant in schools, colleges, class, study, lecture and recitation rooms, theatres, auditoriums and court rooms.

As an illustration the bill fixes the minimum floor space per occupant in school rooms at 15 sq. ft. and the space per occupant at 180 cu. ft.

Violation of the act is punishable by a fine of from $50 to $500.

Howard Coonley, president of the Walworth Mfg. Co., Boston, Mass., who was recently "mustered out" of his war duties after a service of a more than a year as vice-president of the Emergency Fleet Corporation and the United States Shipping Board, was a guest of honor at a reception and dinner given May 7 at the Plaza Hotel Boston, under the auspices of the Heating and Piping Contractors' Boston Association. The guests included Lieut.-Governor Channing Cox, Alfred S. Kellogg, president of the Massachusetts Chapter of the heating engineers' society; William H. Thayer, of the Boiler Manufacturers' Association, Frank A. Merrill, president; Vice-president Herbert A. Snow, and Secretary C. W. Sisson of the heating contractors' Boston association. During his period of war work, Mr. Coonley had complete charge of the business administration of the Emergency Fleet Corporation, with control over all contracts and purchases.

Central Station Heating Notes.

Springfield, Ill.—The Illinois Utilities Commission which has been under fire in the State legislature on charges of inefficiency and inequality in the administration of the laws, has published a statement which says, among other things: "Each city council or legislative body had the right, under the Danville Water Company case, to fix its own utility rates and standards of service. The public utilities act transferred all of the rights, powers and duties of the cities and villages to regulate the rates and service of public utilities to the public utilities commission.

"As long as the commission reduced rates, even when fixing rates lower than those prescribed by the ordinances, no objections were raised by the municipalities of the State.

"From Jan. 1, 1914, to Jan. 1, 1918, as a result of reductions in rates made with the approval of the public utilities commission, the sum of $5,825,000 was saved to the people of the State in decrees of utility rates.

—as sure as the tide— because its a tidal Trap

IF a changing water level is a mechanism, then this is a mechanical trap. But if changing water level can be called "tide" for purpose of clarity, then the Johns-Manville Trap is a Tidal Trap—because change of "tide" operates it.

The Ball—the buoy raising and lowering with the tide. Naturally its volume and weight are predetermined, hence its water level remains at a calculated fixed point. So this Ball, resting free in its chamber, raises and lowers with the tide and so acts in place of rocker arm, thermostat and all the other things that you wish were not in the traps that you know about.

This is why the Johns-Manville Trap is simple in design and why mal-adjustment is actually impossible.

Steam Temperature—amount of condensate or external temperature are not factors that affect the operation when this trap is in series with the return.

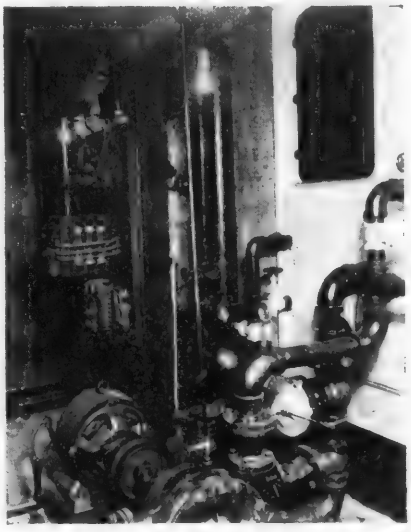
This isn't laboratory talk, nor factory cheering, it is the testimony of 100,000 traps working on the pipe lines of building heating plants, large and small.

Write the branch nearest you for descriptive bulletin and prices.

Through Asbestos and its allied products JOHNS-MANVILLE Serves as Conservation

H. W. JOHNS-MANVILLE CO.
New York City
10 Factories—Branches in 63 Large Cities

JOHNS-MANVILLE Radiator Trap



Humidity Control

is as essential as Temperature Regulation —An Air Washer is as important as a fan for Ventilation.

In fact, the word Ventilation is only used to convey the thought of FRESH, PURE, CLEAN AIR with a proper proportion of moisture, warm in Winter, cool in Summer; and the process by which this is brought about is commonly known as Air Conditioning or, as we call it, ATMOSPHERIC CONDITIONING.

Webster Air Washers

equipped with the well known and long tried WEBSTER SYSTEM OF AUTOMATIC HUMIDITY CONTROL fulfills every requirement.

Call for GUARANTEED RESULTS in your specifications and leave the rest to us.

ATMOSPHERIC
CONDITIONING CORPORATION
Lafayette Building
PHILADELPHIA

"During 1918, due to increase in rates caused by war prices, there was a loss in savings to the people in gas, water and heating rates, but there still continued to be a saving in electric rates. In spite of the increased rates for gas, water, and heating during 1918, and the latter part of 1917, there still remains a net saving to the people of the State of $5,871,000, due to rate decreases approved by the commission since Jan. 1, 1914.

"As to the immediate future," continues the statement, "the emergency orders are coming on for further action and adjustment in over 200 cases. A majority of these cases will involve the complete and exhaustive valuations of the property upon which to fix the permanent rate. The situation is complex and will require all the constructive ability and talents a state body devoting all its time and availing all its experience can bring to the task. To now withdraw from the public utilities commission the jurisdiction to deal with these matters and vest the same in as many cities, villages, and incorporated towns as there are in the State is to open wide the door to inefficient confusion and chaos. Those seeking to bring about the changes at this time should reflect that such legislation would be destructive of public utilities and hurtful to all the people of the State served by them."

Spokane, Wash.—The $2,000,000 plant of the Spokane Heat, Light & Power Company was sold at public auction April 21 by Receiver Ludwig Kemper. The purchasers were F. C. Paine of the Union Trust Company and E. P. Twohy, an attorney. The plant has since been taken over by the Washington Power Company, which was incorporated for the purpose with a capital stock of $1,000,000. The trustees are D. L. Huntington, president of the Washington Water Power Company; Walter E. Compan, manager of the company; and Frank T. Post, attorney for the

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THERMOSTATIC
HEAT REGULATING
SYSTEM

Operated entirely by ELECTRICITY.
Each room is a unit by itself.
Does not depend on an air compressor.
Requires no attention whatever.
Is free from all troubles which usually affect such devices.

GOLD CAR HEATING AND LIGHTING CO.
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Industrial Service

We supply special models of thermometers and temperature recording and controlling devices for upwards one hundred separate and distinct industries, all under our one general trade mark name of

Tycos

These models include many lines not coming strictly under the head of manufacturing, but rather under the broader classification of *industrial uses.*

Our facilities for the production of precise, reliable and permanent instruments are unequalled, while our staff of thermal engineers is thoroughly experienced in selecting proper and adequate apparatus for all industrial requirements.

Upon request we shall be glad to send you our catalogue covering your particular industry.

Taylor Instrument Companies

Rochester, N. Y.

There's a Tycos or Taylor Thermometer for Every Purpose

company. The plant was first offered as a whole, but for this there were no bidders. The receiver then offered it in part. The electrical equipment apparatus and that portion of the business was bid in by Mr. Paine for $140,000. The balance of the property was then bid in by Mr. Twohy for $260,000. The plant, which was built late in 1915, commenced opertions early in 1916. The estimate of $1,500,000 for the construction was increased to $2,000,000 by advancing prices, due to the war. Bonds to the extent of $1,500,000 and preferred stock amounting to $700,000 were sold throughout the East. The terms of the sale agreement call for the payment of $150,000 cash to meet the expenses of the receivership and the issuance to Field, Richards & Co., for the bondholders, of $1,400,000 in 20-year unsecured gold bonds of the Washington Water Power Company. The water power company expects to operate the electrical end and has already organized the Spokane Central Heating Company as a subsidiary organization to operate the heating end of the plant.

Watertown, S. D.—A city central heating plant has been proposed for Watertown, the matter having been brought before the city council by Mr. Larsen, an engineer of St. Paul. Mr. Larsen made the statement that 95 per cent of the consumers of central station heat would come through with reduced costs; for the others it would be about the same as under the individual plan. The proposal is to treat each block as a unit with circling main heating pipes through the outside basements, excavating in the streets only enough to run the pipes across. The plan of financing proposed is not to issue bonds, but by taking notes from business places to benefit by it, these notes then being retired and the interest paid by the collection of charges for heating; under this plan the average time taken to retire the notes is seven years. The engineer based these figures on an average cost of 60 cents per 1,000 lbs of condensation. It would take three or four months to install the plant; with the estimated cost of changing over from the present plan $7 per radiator.

Springfield, Mo.—Evidence was taken during the past month by the Missouri Public Service Commission in connection with the application of the Springfield Gas & Electric Company for permission to increase its rates for steam heating. The application was filed last Fall. The company then asked for an increase in the rates charged for steam which would prac-

TECHNICAL CONTROL
The Day of Certainty

The modern producer no longer depends upon the "experience" of "an old-timer at his game," to control the processes employed in manufacturing his product. There was a day when steel was treated "by the eye" or "by the experience" of a workman who had done the thing over and over, until his guess was *likely* to produce good metal. Today, the electrical pyrometer, way off in the Chief Engineer's office perhaps, *technically controls* the process,—makes it certain, uniform, positive.

In nearly two hundred of America's prominent industries they are *technically controlling the weather*, with Carrier Equipment. They are making "Every day a *good* day" by *manufacturing their own weather.*

If temperature or humidity affects your product, or the efficiency of your labor, our Bulletin 100-V is worth money to you. It's gratis upon request.

Write right now

Carrier AIR CONDITIONING AND DRYING EQUIPMENT

Carrier Engineering Corporation

"EVERY DAY A *GOOD* DAY"

39 Cortlandt St., New York, N. Y. BOSTON BUFFALO CHICAGO, ILL. PHILADELPHIA

Specify Buffalo

One of the important factors of every building about to be constructed is the heating system. Obviously to give the client the most for his money is the first consideration.

It is comparatively simple to install a heating system, but it is another matter to make it always efficient.

Buffalo Fan Systems are no higher in first cost, and their upkeep is offset by the saving in heat; the increase in efficiency of the workers.

Putting heat mechanically just where it is wanted by keeping it in circulation instead of letting it escape thru the ventilation in the roof, is the cheapest and best way.

Catalog No. 198 gives valuable engineering data on heating and ventilating problems. Our engineering department is always available for consultation.

Write Dept. No. 36

BUFFALO FORGE CO.

BUFFALO. N. Y.

tically double the present rates. Protest was made by the patrons of the central heating department on the ground that insufficient notice had been given. A compromise was reached by which an increase of about 25% was authorized. The present hearing is on the original application.

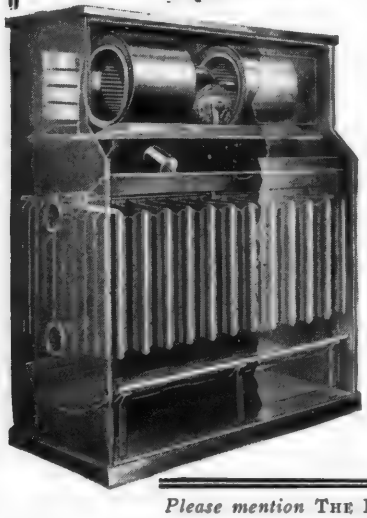
Col. R. H. Abbott, president of the Abbott Power & Light Co., Petersburg, Ill., died May 3, following an operation for appendicitis.

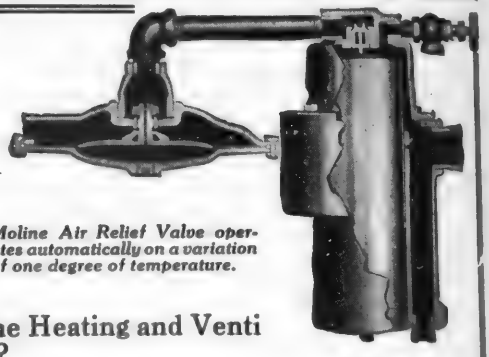
Belvidere, Ill.—Patrons of the central heating system of the Illinois Northern Utilities Company have taken court action to ascertain the company's ruling on the question as to whether heat shall be furnished by the present plant to the patrons of the company during the coming season and, if so, at what price, and also that in case an adverse decision as to the continued operation of the present plant the coming season, the public utilities commission be requested to rule on the question of a new heating plant being installed and the price at which heat would be furnished from such plant The patrons of the heating system are confronted by the need of an early decision in order that they may make arrangements for some other method of heating, providing the central system is to be discontinued. Some houses need considerable changes to adapt them to private plants The utilities company seeks to abandon the local heating plant, declaring that it has been a losing proposition. When the State Utilities Commission ordered the continuance of the plant during the past winter they gave the company the privilege of raising the rates from 18 cents to 26 cents per square foot of radiation. It is believed that the patrons would consent to a still further raise in the price if they can retain the heating service. It was stated by a member of the public utilities commission that it is not the policy of the commission to permit the abandonment of plants like this, that they should be kept open for emergencies when the furnishing of light and power from outside sources might be temporarily interrupted. It has been supposed that with the heating plant off their hands the Illinois Northern would seek to close the Belvidere electric light plant, furnishing all of their power from Waukegan. As the water from the Belvidere central heating system is heated by exhaust steam from the plant many of the patrons believe that an arrangement for the continuation of the heat can be made if the company finds it necessary to keep their local plant

Are *you* a high-class sales representative?

The UNIVENT

"LIVE OUTDOORS-INDOORS"





Moline Air Relief Valve operates automatically on a variation of one degree of temperature.

Are you a Manufacturers' Sales Agent?

Do you know the Heating and Ventilating Business?

Do you know the Trade and Architects in your territory?

Have you full confidence in your ability to sell a good product?

IF SO—

we have a plan whereby you can earn more than you ever earned before, besides establish a business for yourself.

It will pay you to get in touch with us immediately, while there is some very good territory open for the sale of Moline Heat and the Univent.

Moline Illinois

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

THE UNIT HEATER

was first placed in use in 1870 by B. F. Sturtevant, founder of the B. F. STURTEVANT COMPANY. Since that time, through careful study and engineering pratice, the present day Portable Unit Heater has been perfected. It is just one of the large and growing family of

Sturtevant
(REG. U. S. PAT. OFF.)

Independent Unit Heater

Its relation to the heating of shops and factories is similar to replacement of the old line shafting, by the unit motor drive.

It eliminates expensive, cumbersome overhead piping; it warms just the portion you wish heated; the exhaust steam from the small turbine, driving the disc or propeller fan, heats the steam coils. Its economy is apparent, and its efficiency has been proven.

The following are typical users:

HYDRAULIC PRESSED STEEL CO.
AMERICAN LOCOMOTIVE CO. (5 plants)
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Our Engineering Staff, with the benefit of this fifty years of experience is at your service. Estimates given without obligation.

B. F. STURTEVANT COMPANY

Hyde Park, Boston, Mass., U. S. A.

AND ALL PRINCIPAL CITIES

open which the commission is likely to order to protect the users of electric lights and of electric power.

Oswego, N. Y.—Captain P. J. Traband, constructing quartermaster at Fort Ontario, has announced that a new central heating plant will be installed at Madison Barracks the coming summer. The estimated cost is $10,000.

Central Power Company, Newark, O., is the changed name of the Ohio Light & Power Co., Fremont, O.

Manufacturers' Notes.

Excelso Specialty Works, Buffalo, N. Y., manufacturers of Excelso heaters for storage tanks, has moved its main offices to 601 White Building, Buffalo.

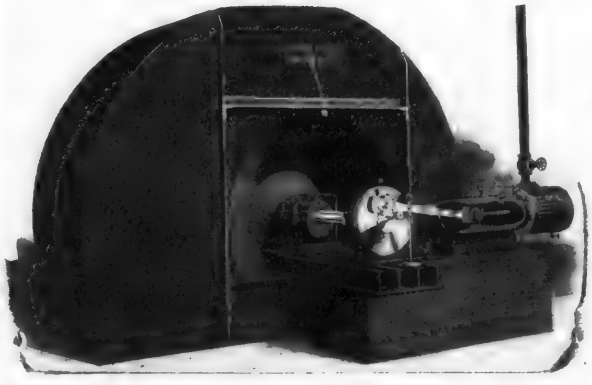
Abram Cox Stove Co., Philadelphia, Pa., has appointed E. F. Glore general manager of sales for the company.

Mathis Bros. Co. and the **New York Blower Co.,** Chicago, Ill., announce the removal of their offices to the Transportation Building, Harrison and Dearborn Streets, Chicago.

Ross Heater & Mfg. Co., Buffalo, N. Y., manufacturer of the Ross line of heaters and expansion joints, announces the removal of its offices to the company's new factory location, 1407-1411 West Avenue, Buffalo.

American Blower Company, Detroit, Mich., announces that James Inglis, president of the company, sailed from New York May 15 as a member of a commission appointed to confer wtih European cotton interests on post-war conditions in the cotton industry throughout the world and with special reference to the proposed world cotton conference to be held in New Orleans next October. While connected with the War Industries Board, Mr. Inglis was chairman of a joint committee made up of several governmental departments whose purpose was to secure better baling of cotton and less wasteful methods of handling the cotton crop, and while definite and very satisfactory results were secured during the war, there is much more to be done and as a matter of public interest, Mr. Inglis is continuing his connection with the work, being transferred like most of the other activities of the War Industries Board that were perpetuated, to the Department of Commerce. Mr. Inglis will also visit Belfast, Ireland

Heating Ventilation
Drying Air Washers
Engines Mechanical Draft



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Get Catalogues 65-B and 67-B

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MAIN OFFICE:
513 Transportation Bldg., 608 S. Dearborn St., Chicago, Ill.
Toledo, O.: Room 629 Nicholas Bldg.

WORKS:
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The Hotel Cleveland

Graham, Probst, Anderson & White, Architects

W. G. Cornell Co., Heating Contractor

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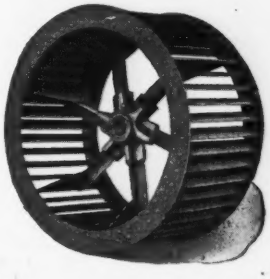
Move 388,372 Cubic Feet of Air

per minute in The Hotel Cleveland. For the ventilation of this hotel the engineers chose 16 single and 2 double width Massachusetts Modified Squirrel Cage Fans because of their great capacity, extreme efficiency and economy of operation.

The services of our engineering department are at the disposal of any architect or builder whose plans include the installation or remodelling of a ventilating system.

Condensed Bulletin of Fans, Blowers, Heaters, Etc. Sent Free on Request



MASSACHUSETTS BLOWER COMPANY
WATERTOWN·MASS·

NEW YORK BOSTON CHICAGO

Branches in 20 Principal Cities throughout the Country

100-6

to confer with his associate in the blower business, Mr. Davidson, of the Sirocco Engineering Works.

Equitherm Control Corporation, New York, has leased a four-story building at 13 Tillary Street, Brooklyn, for manufacturing purposes. The company will continue its plant at 203 Greenwich Street, New York.

International Heater Co., Utica, N. Y., has established a caféteria in its building No. 5 at the foot of Hubbell Street, Utica. Meals are served at 25 cents each by the Utica Caféteria Company, the International Heater Company furnishing the room, gas, heat and water free of charge. The restaurant served 130 of the company's employees on the first day of operation. Its establishment is designed as a step in the company's Americanization plans.

Scott Valve Co., Detroit, Mich., is the new name of the Roe Stephens Mfg. Co., well-known as manufacturers of steam valves. In addition to the Roe Stephens line, the new company will market a number of new specialties for the heating trade. President, C. W. Thomas; vice-president, E. W. Thomas; treasurer, R. J. Thomas; secretary, F. P. Thomas.

Hersh & Bro., Allentown, Pa., have purchased the business of the Bicalky Fan Company, Buffalo, N. Y., and will manufacture the Bicalky line of fans, ventilators and air washers.

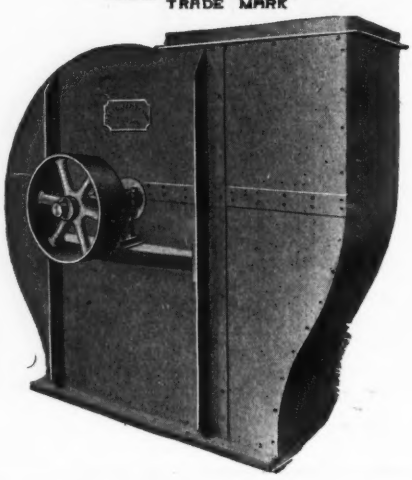
American Radiator Company, Chicago, Ill., announces a regular quarterly dividend of 3% in its common stock, payable June 30, and a quarterly dividend of 1¾% on its preferred stock, payable May 15.

Ohio Brass Co., Mansfield, O., has moved its Chicago office to 1217 Fisher Building from 508 to 1217 Fisher Building, Chicago.

Carrier Engineering Corporation, New York, announces that E. P. Heckel has been transferred to the Chicago office as western manager of the corporation. Before his departure for Chicago, Mr. Heckel was made vice-president of the corporation. A. E. Stacey, formerly western manager at Chicago, has been transferred to New York as head of the corporation's department of research and development. Mr. Stacey will make his permanent residence in the East and will devote his time and that of a selected staff exclusively to the improvement of apparatus and the development of new industrial applications.

GARDEN CITY CYCLOIDAL MULTIVANE FANS

Cycloidal MULTIVANE FANS
TRADE MARK



Efficient and Durable

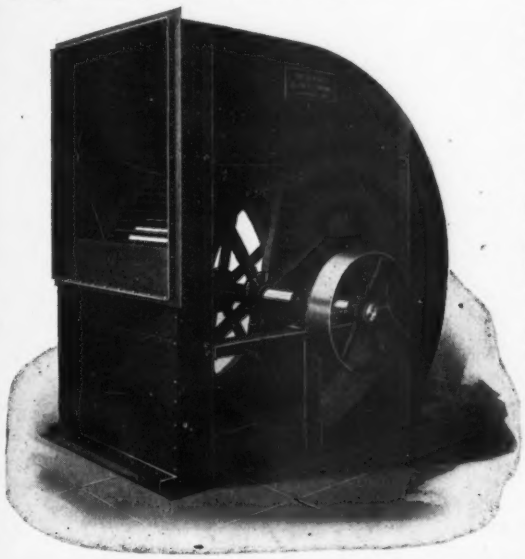
Perfected after 35 years' experience in manufacture of Fans and Blowers of every description.

Send in your name for our new *"Multivane Bulletin"* containing full data on construction and performance of all sizes.

GARDEN CITY FAN CO.
Established 1879
McCormick Bldg. CHICAGO, ILL.
L. J. WING MFG. CO., New York City, Est. Rep's

Buckeye Multiblade Fans

are made especially for low pressure Heating and Ventilating work. They are giving perfect satisfaction.



CORRECT DESIGN. HEAVY CONSTRUCTION, NOISELESS OPERATION, WORKMANLIKE FINISH, HIGHEST EFFICIENCY.

Our Engineering Department is maintained for the purpose of assisting Engineers, Architects, etc., in planning efficient Heating and Ventilating Systems for all buildings.

THIS DEPARTMENT IS FREE TO YOU.

We also manufacture a complete line of Disc, Cone and Steel Plate Fans.

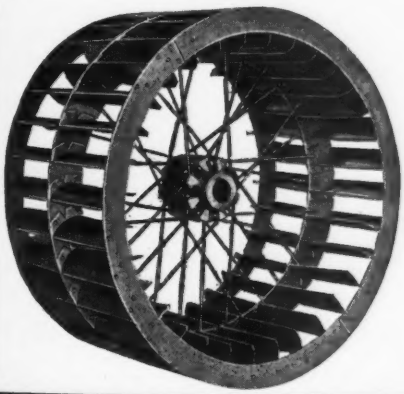
Write us

BUCKEYE BLOWER CO.

COLUMBUS, OHIO.

The Fan and the Wheel PLEXIFORM

Maximum air delivery against low or medium-high resistance from a minimum of housing
Highest obtainable mechanical efficiency
Strength
Lightness
Quietness in operation



A method of construction equally adaptable to high as to low pressures and as practicable for double-width as for single-width fans.

Our Bulletin 17-V is a handbook on fan design
Sent on request

BAYLEY MFG. CO., Milwaukee, Wis.

New Firms and Business Changes.

American Heating & Plumbing Co., Atlanta, Ga., is the title of a new corporation in that city. The principal stockholder is D. V. Tidwel, formerly of Macon, where he was associated with one of the leading heating and plumbing concerns in the State.

John A. Connolly, New York, for many years a well-known figure in heating engineering circles, and who, during the past few years, has been engaged in newspaper work, has returned to the trade, having been appointed heating representative for the I. J. Barth Plumbing & Heating Co., contractors, 217 West 29th Street, New York. Mr. Connolly is one of the old-timers among heating men, having been associated with such firms as the Mercer Company, Gold's Heater Mfg. Co., Victor Heating Co., John F. Sayward Co., Thompson-Starrett Co., and the H. B. Smith Co. His experience covers a period of 30 years, acting in a responsible supervisory capacity. He will have entire charge of the steam and hot water heating, power and ventilating departments of the I. J. Barth Plumbing & Heating Company.

JENKINS VALVES are made of a better grade steam metal, and are of a much stronger and heavier construction. This added strength obviates the trouble frequently arising from expansion and contraction, lifting and settling in the piping, and other strains to which valves are subjected.

Jenkins Radiator Valves include angle, globe, offset corner and regular corner types in a variety of finishes.

Install valves of proven dependability—specify Jenkins Valves, the result of fifty years' practical experience.

JENKINS BROS.

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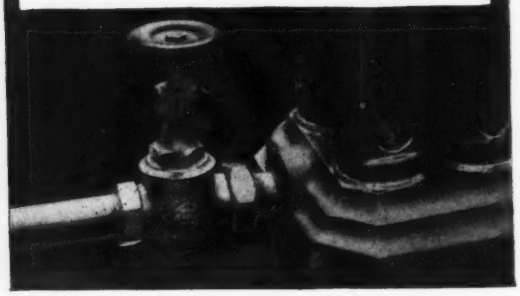


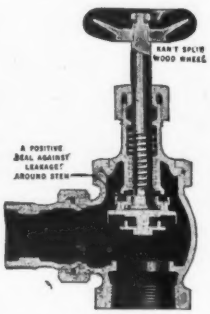
Jenkins Valves

MARSH

UNION BONNET
DOUBLE SEAT
VALVES

For SCREWED BONNET Pattern and detail UPPER SEAT feature, see CUT PAGE 100, September issue.

For GATE LINE see OCTOBER issue.



While we manufacture a FULL LINE of HIGH PRESSURE MILL SUPPLY Valves, GLOBES, ANGLES, and GATES, we SPECIALIZE on RADIATOR Valves and furnish ALL PATTERNS,—GLOBES, ANGLES, CORNER and BACK OFFSETS, PACKLESS, MODULATED and GATES complete.

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MARSH VALVE COMPANY, Erie, Penna.

Keeler Cross Drum Water Tube Boiler

designed for hotels, school houses and office buildings and especially adapted for use where economy of space is necessary; built for high or low pressure and in units from 75 to 500 horse power.

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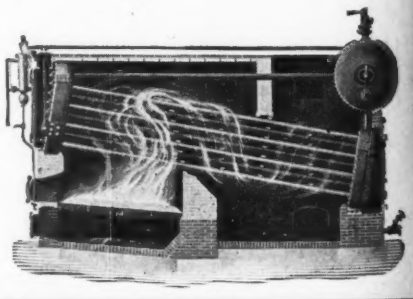
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